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ABSTRACT

This portion of the Center for Information Services (CIS) project report contains development schedules, task assignments, and discussions of pertinent issues as they relate to the projects next phase (IIB). Sections II, III and IV (including Appendix A) contain current schedule, organization, and task information accompanied by the appropriate identification of responsibilities within the University of California at Los Angeles (UCLA) and within the project. Section V identifies the several committees, including established user committees, already formed to help guide CIS development. The final sections (VI through IX) provide resources information pertinent to the remaining development and operational phases of CIS. (For related documents see LI 003295-LI 003297 and LI 003299 through LI 003301). (Author/NH)

CENTER FOR INFORMATION SERVICES

PHASE II: DETAILED SYSTEM DESIGN AND PROGRAMMING

NSF GRANT GN-827

PHASE IIA FINAL REPORT

PART 4

DEVELOPMENT SCHEDULING AND PLANNING

by

Robert L. Carmichael

1 April 1971

Institute of Library Research
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Los Angeles, California

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I. INTRODUCTION

During September and early October 1970, the development status of the Center for Information Services project was carefully reviewed by representatives of the Institute of Library Research (ILR), the Campus Computing Network (CCN), and the University Library. While Phase IIA work continued, planning activities for Phase IIB were initiated by ILR to provide a basis for continued CIS development and to provide a framework for the Phase IIB proposal document.

In view of the requirement to plan for the integration of CIS into the University Library environment, first at UCLA and eventually at the other UC campuses to meet CIS/LSD (Library Systems Development project of the University of California) integration needs, several areas were identified as needing study and clarification to support the continuing phases of CIS development. Included were items such as: task identification, scheduling, documentation guidance, user needs, data base availability, operational procedures, university support, system test and evaluation, and development responsibility.

SCOPE

This portion (Part 4) of the Phase IIA Final Report contains development schedules, task assignments, and discussions of pertinent issues as they relate to Phase IIB. The information concerning schedules, assignments, and priorities reflects the currently funded 18 month development period for Phase IIB (1/71-6/72) rather than the 12 month period proposed in the Phase IIB supplement to the original Phase II Proposal. During this phase (Phase IIB) and Phase III, prime development responsibility lies with CCN. At the end of Phase III, prime responsibility will transfer to the Library during implementation and will remain with the Library. After Phase IV, operational responsibility including full economic support lies with the University Library.

During Phase IIB, the Institute of Library Research, Campus Computing Network, and the University Library will jointly participate in developing and providing mechanized information services to the University community. CCN is concerned with information processing system design and operation; the Library is oriented toward data base acquisition, procedures, and experimental services; and ILR activities include coordination, documentation, and considerations of system test and evaluation. The tasks, allocations, and schedules as presented will undoubtedly change over time to reflect CCN and Library ordering of priorities, available funds, and NSF-approved development schedules.

Sections II, III, and IV (including Appendix A) contain current schedule, organization, and task information accompanied by the appropriate identification of responsibilities within UCLA and within the project. Section V identifies the several committees, including established User Committees, already formed to help guide CIS development. The final sections (VI through IX) provide resource information pertinent to the remaining development and operational phases of CIS. For those unfamiliar with this development, the following paragraphs review briefly the rationale and concept of a Center for Information Services. A more complete description will be found in Part 3 of the Phase IIA Final Report "Software System Design and Related Software Activities."

CENTER FOR INFORMATION SERVICES

The purpose of the proposed Center for Information Services is to provide a location on the UCLA campus at which data bases becoming available from national resources can be acquired, stored, and made available to the research community of the University of California. Many of the issues to be resolved are technical but other equally important issues to be investigated and resolved are administrative, legal, jurisdictional, and economic in nature. Many aspects of CIS including the above issues were investigated and the results recorded during Phase I. Design goals and system development issues have been discussed in the basic Phase II proposal and Phase IIA and Phase IIB supplements; many are repeated in this document.

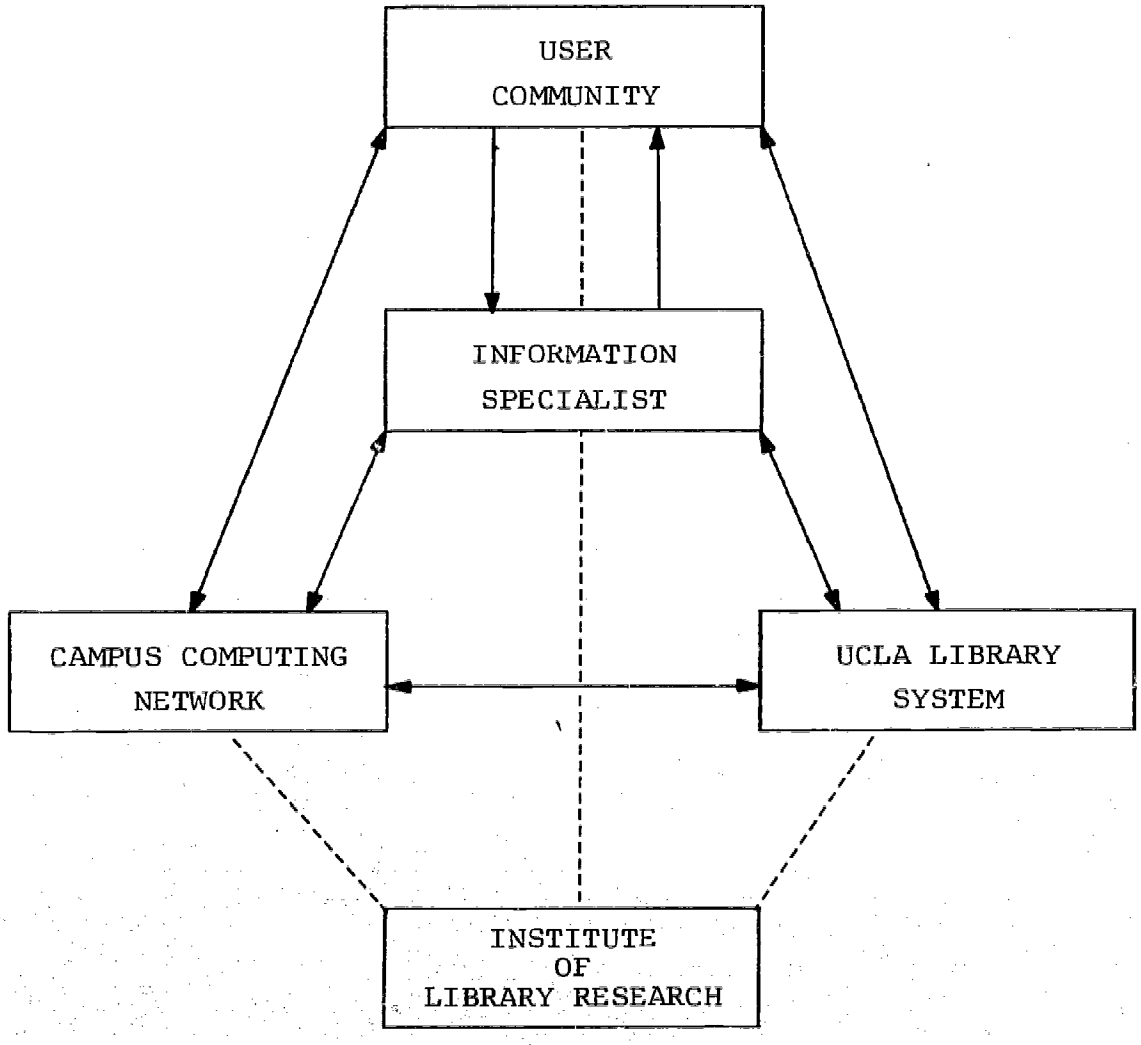
The operational Center for Information Services as presently conceived services the user community through one or more communication channels, the selection determined by the nature of the request and the appropriate response configuration. As shown on Figure 1, most of the user requests are channeled through information specialists. Service responses may come directly from the University Library, from the Campus Computing Network (CCN), or from both.

In this model the Institute of Library Research (ILR) does not perform a direct service function but supports a program of research and evaluation that interacts with all elements of the system. The Library provides the necessary service functions except for the actual computer processing, which will be performed by CCN. In addition to initially developing and implementing the system design (Phase II), CCN will continue to provide the support required for system maintenance and improvement. The user community, viewed initially with the help of user committees, will represent a wide spectrum of needs, capabilities, and required services.

Not all of the development issues are technical or such that they are readily solved by software development and hardware installation. Three examples of issues which must be resolved by the University and

FIGURE 1

OPERATIONAL DIAGRAM
CENTER FOR INFORMATION SERVICES



the University Library as well as the project, are discussed below to emphasize the range of concern. The first describes a new role, that of the Information Specialist. Where does he fit in the University organizational structure? The second example is concerned with the transfer of CIS operations to the Library. Will the funds be budgeted? Can costs be recovered? The final paragraph alludes to the interface of CIS development with total UC library automation efforts. How can they be integrated?

The Information Specialist

Since it is clear, at least initially, that most users of the CIS information processing system will not have the credentials or interest to use the computer programs directly, we propose to establish a group of people, called information specialists, who will act as an interface between the user community and the computer. In this capacity, they will not only control the data flow between the user and the computer, but will also have major responsibilities in such areas as user feedback and evaluation, user consulting, interfacing with the CCN programming staff, and preparing and maintaining documentation for users. In Phase IIB documentation will be prepared detailing the role of an information specialist; following is an outline of the areas to be detailed.

Input and Output Handling. The information specialist will receive requests from users, and if the requests are not in a machine-readable format, he will prepare them in a manner appropriate for use by the computer. He will be knowledgeable of the programs to be used, at least in an operational capacity. Similarly, he will collect output from the computer and distribute it to the users. Data bases (i.e., magnetic tapes) will be given to him and he will then place them in the tape library at CCN, or, when necessary, pass them on the programming support staff if they are not in a useable state.

User Feedback and Evaluation. The information specialist will collect and document users' usage feedback (from interviews, questionnaires, etc.) to be used for three chief purposes: to identify new applications, detect operational errors, and identify areas in which CIS is failing users' needs.

User Consulting. The information specialist will consult with users in order to assist them in two principal areas: (1) ways in which CIS may be used to solve their information-processing problems, and (2) special problems that individual users may encounter (e.g., phrasing of profiles, interpreting output, etc.).

Programming Interface. Although the information specialist will not be intimately involved with programming details, he will report to the programming staff the results of his user evaluation studies so that necessary changes can be implemented. If he discovers that a user has

received erroneous results, he will give this information to the programming staff so that system flaws can be corrected. The information specialist will also report system changes to the user community if those changes affect how users use the system.

Documentation. The information specialist will prepare and maintain documents for use by users-at-large. He will also prepare from time to time documents discussing usage and evaluation of the system, including special problems that may occasionally arise.

Transfer of CIS Operation to the Library

An important Phase IIB task will be the specifications of procedures for the transfer of the operation of CIS to the Library. Specifications to be developed include procedures for administration and operation, job descriptions for CIS staff, and the funding for CIS.

The operational procedures will be developed by the Library with assistance from ILR and CCN. The procedures include operation of the CIS software, acquisition, indexing, and storage of the data bases, and how and when the user obtains service.

The staff required for the CIS operation must be identified and job descriptions written. The information specialist has already been identified and some thought given to his duties. During Phase IIB the information specialist's task will be handled jointly by CCN and Library personnel. The experience gained in Phase IIB will help in producing the job description.

Funding. The funding of an operational CIS must be studied in some detail. It has always been envisioned that CIS will be an addition to the Library. Cost-sharing among the users of CIS will be investigated.

University Commitment. The Center for Information Services is to become a completely operational service which meets the daily needs of the University community. The commitment of the University to this project and to its continuation as an operational service was stated in the Supplement to the Phase II proposal (23 January 1969), and also in letters from Chancellor Charles E. Young to Robert M. Hayes (7 January 1969) and from Vice Chancellor David Saxon to Edward C. Weiss (15 September 1970).

In his letter Chancellor Young confirms "the commitment of the Campus Administration not only to the development of the 'Center for Information Services' which you proposed, but to its continuing operation." Regarding the continued, operational funding of the CIS services, Vice Chancellor Saxon states in his letter that "three types of cost can be identified: acquisition, services of personnel, and computer processing services. The first is likely to be funded both by

users...and by special university budgets for acquisition of data bases of broad utility.... The second is likely to be budgeted as part of university supported staff in the library and the computing facility. The third is likely to be funded by direct charges to users for services, with intra-mural funds available where they are needed." In summary, Vice Chancellor Saxon points out that "the Chancellor has reaffirmed his commitment to the project...and to the need for finding appropriate means of meeting the operational costs following the end of NSF support."

In a letter from Robert Vosper to Robert Hayes (6 January 1969), Mr. Vosper discusses the Library's commitment to providing the services being developed by CIS, and his interest in resolving the fiscal problems of an operational CIS.

On November 3, 1970 a meeting was held with Robert Vosper, William Kehl, and Adrian Harris, the Director of Planning for UCLA. At that meeting Adrian Harris agreed that "UCLA will recognize the CIS need in putting together our campus budget proposal for 1973-74 (start up funds only) and in 1974-75. The amount of need will not be known until the project is at least partially completed. We will rely on the Library to provide input data for the budget proposal."

Interaction With The Library Systems Development Group

The University Library Systems Development (LSD) project involves the use of computers to automate many of the library functions. It is being developed under the joint effort of all nine campuses, each of which is participating in the program development. CIS is a UCLA project effort. The results of the CIS project will be made available to the University-wide Library Systems Development as appropriate. However, an arrangement whereby data base problems affecting all campuses could be investigated now for early resolution is highly desirable. Support by the University during these formative stages of CIS development would significantly shorten the time that will otherwise be required to resolve inter-campus and intra-campus issues of compatibility, vested interests, legal restrictions, duplicative development and processing efforts, impact on communication requirements, on-line inquiry by remote (campus-to-campus) terminal, and the development of effective user charge policies.

II. DEVELOPMENT SCHEDULE

LONG RANGE PLANS

During the final quarter of Phase IIA much attention was given to the long range plans for CIS. Planning included the clarification of the phases of the project, the identification of the major tasks to be performed by each group during each phase, personnel requirements, costs and funding, and the Phase IIB task schedule. Discussions of these topics were included in the proposal submitted to NSF for Phase IIB but, after the Phase IIB proposal* was submitted, it was necessary to change the timing of Phase IIB from 1 January 1971 - 31 December 1971 to 1 January 1971 - 30 June 1972, and that of Phase III from 1 January 1972 - 30 June 1973 to 1 July 1972 - 30 June 1973. The revised schedule and some of the implied constraints are reflected in the discussions which follow. Preliminary development plans based on the initial time frame are included in Appendix A.

Clarification of Phases

In the original proposal the developmental plan of CIS was divided into the following four phases:

Phase I. Feasibility and Preliminary Specifications

Phase II. Detailed System and Programming Design

Phase III. Computer Programming Development and Test

Phase IV. Implementation and Initial Operation

Because of limited funding, it was necessary to divide Phase II into two parts, A and B. Two supplements to the original Phase II proposal have now been written (Phase IIA, Phase IIB) to reflect funding constraints and to extend the time period of Phase II. To clarify any confusion that may have arisen because of the change, the phases as they now envisioned are described below. The primary difference is the inclusion of the development of the prototype system in Phase II. This change is possible because of the decision that the computer programming could be done completely "in-house" at UCLA.

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*Phase IIB Supplement to A Proposal for Development of a Center for Information Services, Campus Computing Network, University of California, Los Angeles, November 17, 1970.

Phase I: Feasibility and Preliminary Specifications. (Completed) This phase has been completed and is described in a 13-part report to NSF (see "Mechanized Information Services in the University Library," NSF Grant GN-503, Institute of Library Research, UCLA, 15 December 1967).

Phase IIA: Requirement Specification and Basic Design (1 July 1969 to 31 December 1970). (Completed) This phase has been completed and this document is one of the set of 7 that comprises the Final Report. Briefly, this phase saw the organization of CIS user committees, organization of a series of seminars on CIS for library personnel, experimentation with a variety of sample data bases, installation and initial operation of two interim software systems, identification of documents and procedures required for further CIS development, and the basic design of the CIS software system.

Phase IIB: Detailed Design and Prototype Development (1 January 1971 to 30 June 1972). Transfer of project responsibility from ILR to CCN took place at the start of this phase when Mr. William Kehl, Director of CCN, became the Principal Investigator. Activities will center around experimental operations with interim software, additional seminars for library personnel, development of operational procedures for transfer of the operation to the Library, development of test and evaluation studies, acquisition of selected data bases, development of a prototype using procedures developed during this phase. Development of the prototype will be the major task of this phase.

Phase III: Prototype Operation and Operational System Completion (1 July 1972 to 30 June 1973). During Phase III the prototype system will be in operation with a selected set of services while the remainder of the software system, including interactive capabilities under the Time Sharing Option of the IBM Operating System 360, is completed. The prototype will be operated jointly by CCN and the Library. Procedures for the operational system will be completed and a phased transition of the operational responsibility to the Library will begin. Extensive test and evaluation of the total CIS operation will take place to assist the revision and refinement of policies and procedures. Acquisition of data bases will continue.

Phase IV: Implementation and Evaluation of Services (1 July 1973 to June 30 1974). Formal transfer of the responsibility of the CIS project from CCN to the Library will take place at the beginning of this phase with Mr. Robert Vosper, University Librarian, becoming the Principal Investigator. The major task will be to make the transition from a developmental project to smooth-running operational service. Additional software services for users will be added in response to the evaluation study and to users' experiences and requests. Operational policies and procedures will be improved as needed. Ongoing system evaluation procedures that will provide the information necessary to continually mold the system to fit the user community's needs will be implemented. The system software will be improved as needed to insure an efficient, cost-effective operation.

MAJOR TASKS AND SUPPORT REQUIREMENTS

The major tasks to be performed by each group are shown in Figure 2. For shared tasks, the group shown at the top of the bar is responsible for completion of the task. Note that the primary responsibility for the project shifts from ILR to CCN at the beginning of Phase IIB, and from CCN to the Library at the beginning of Phase IV.

Personnel Requirements

The estimated personnel requirements in full-time equivalents (FTE's) are shown in Figure 3. These figures will probably be revised slightly as the project progresses. Although personnel for CCN and ILR are not shown for CIS after the first year of operation, assistance from both groups will be available if needed. Such needs may arise in the area of operational evaluation.

Costs and Funding

Estimated costs and funding for the remaining phases are shown in Figure 4. These estimates differ slightly from those given in the Phase IIB proposal in that computer time is included here in the CCN costs rather than in the Supplies and Expense costs. This is consistent with the notion that CIS is purchasing programming services from CCN. Note that these figures reflect the current estimates for the cost and funding areas given and most likely will change somewhat as the project progresses.

FIGURE 2

MAJOR CIS TASKS

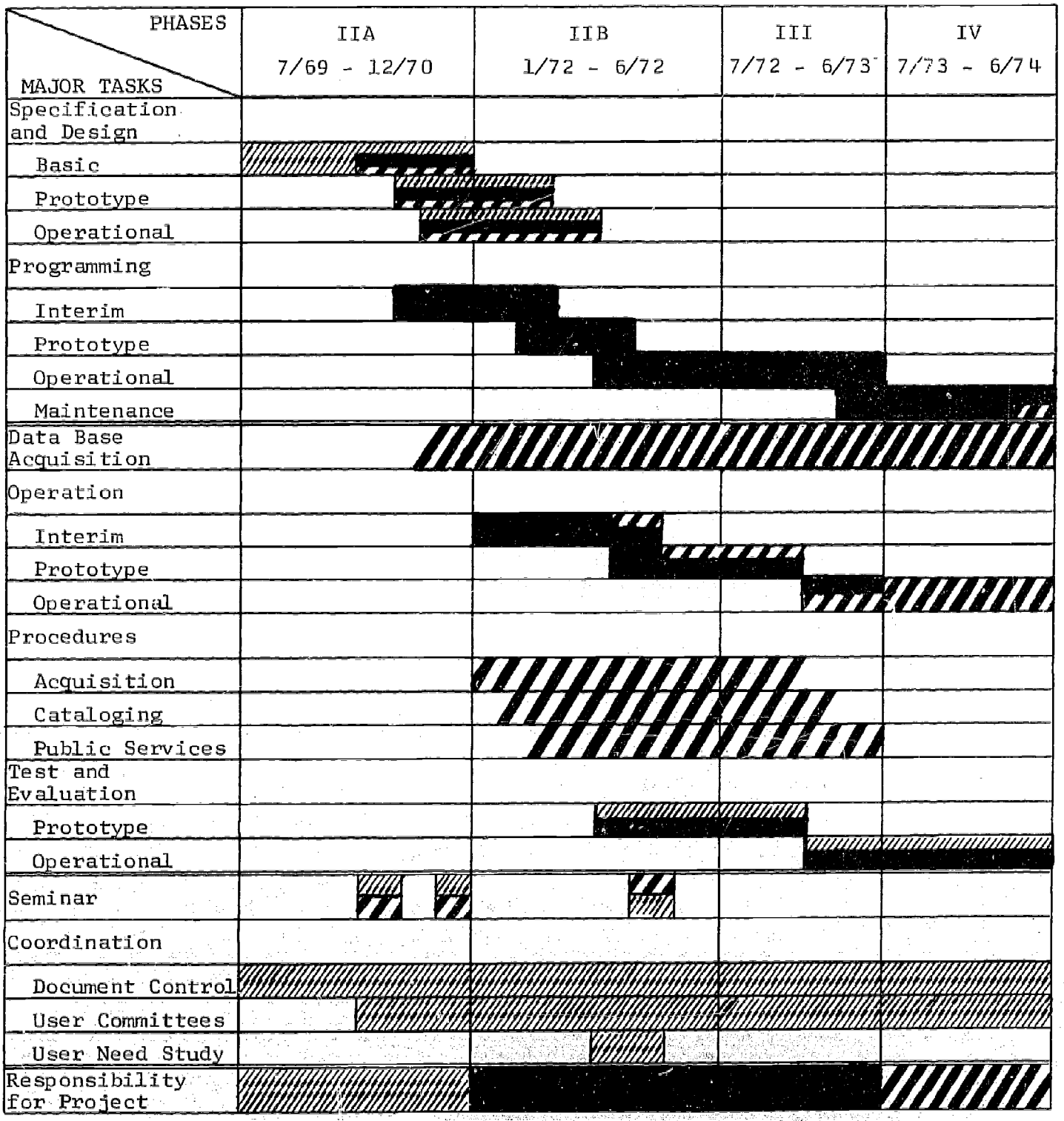


FIGURE 3

PERSONNEL REQUIREMENTS

(Estimated)

PHASES (by Quarter)	FTE's	LIBRARY	CCN	ILR	ADMIN.	TOTAL
IIB	1	2	9	4	.5	15.5
	2	2	9	4	.5	15.5
1/71	3	3	9	4	.5	16.5
to	4	4	9	3	.5	16.5
6/72	5	4	9	3	.5	16.5
	6	4	9	3	.5	16.5
III	1	5	9	3	.5	17.5
	2	5	9	3	.5	17.5
7/72	3	5	9	3	.5	17.5
to	4	5	8	3	.5	16.5
6/73						
IV	1	6	7	2.5	.5	16.0
	2	6	5	2.5	.5	14.0
7/73	3	6	3	2.5	.5	12.0
to	4	6	2	1.5	.5	10.0
6/74						
1st Year	1	6	1	0	0	7.0
	2	6	1	0	0	7.0
7/74	3	6	1	0	0	7.0
to	4	6	1	0	0	7.0
6/75						
Subsequent	1	7	0	0	0	7.0
Years	2	7	0	0	0	7.0
	3	7	0	0	0	7.0
	4	7	0	0	0	7.0

FIGURE 4

ESTIMATED COSTS AND FUNDING FOR CIS

(Thousands of Dollars)

COSTS

PHASES / AREAS	IIB 1/71-6/72	III 7/72-6/73	IV 7/73-6/74	1st Year 7/74-6/75	Subsequent Years
LIBRARY	54	65	80	70	75
CCN	206	180	113	20	30
ILR	26	18	15	0	0
ADMINISTRATIVE	18	12	12	0	0
DATA BASE ACQUISITION	9	40	60	75	90
SUPPLIES AND EXPENSE	25	20	20	10	15
TOTAL	338	335	310	175	205

FUNDING

PHASES / AREAS	IIB 1/71-6/72	III 7/72-6/73	IV 7/73-6/74	1st Year 7/74-6/75	Subsequent Years
NSF	300	300	200	0	0
CAMPUS USERS	2	10	30	80	100
OTHER SOURCES	0	0	10	25	25
UNIVERSITY	36	25	40	75	80
TOTAL	338	335	310	175	205

III. ORGANIZATION

PHASE IIB ADMINISTRATION

Project responsibility was transferred from ILR to CCN at the start of Phase IIB.

Investigators

As described in the previous section, William B. Kehl, Director of the Campus Computing Network, is designated Principal Investigator for Phase IIB. This is appropriate since a major effort during this phase is related to computer programming development. Robert Vosper, UCLA University Librarian, will continue to serve as Co-Investigator. Starting with Phase IIB, Harold Borko, Professor in the Graduate School of Library Service, and Robert L. Carmichael, Manager of the Institute of Library Research, Los Angeles, will become Co-Investigators. Professor Robert M. Hayes, the Principal Investigator in the previous two phases of the project, has agreed to serve as an advisor to CIS during the coming year.

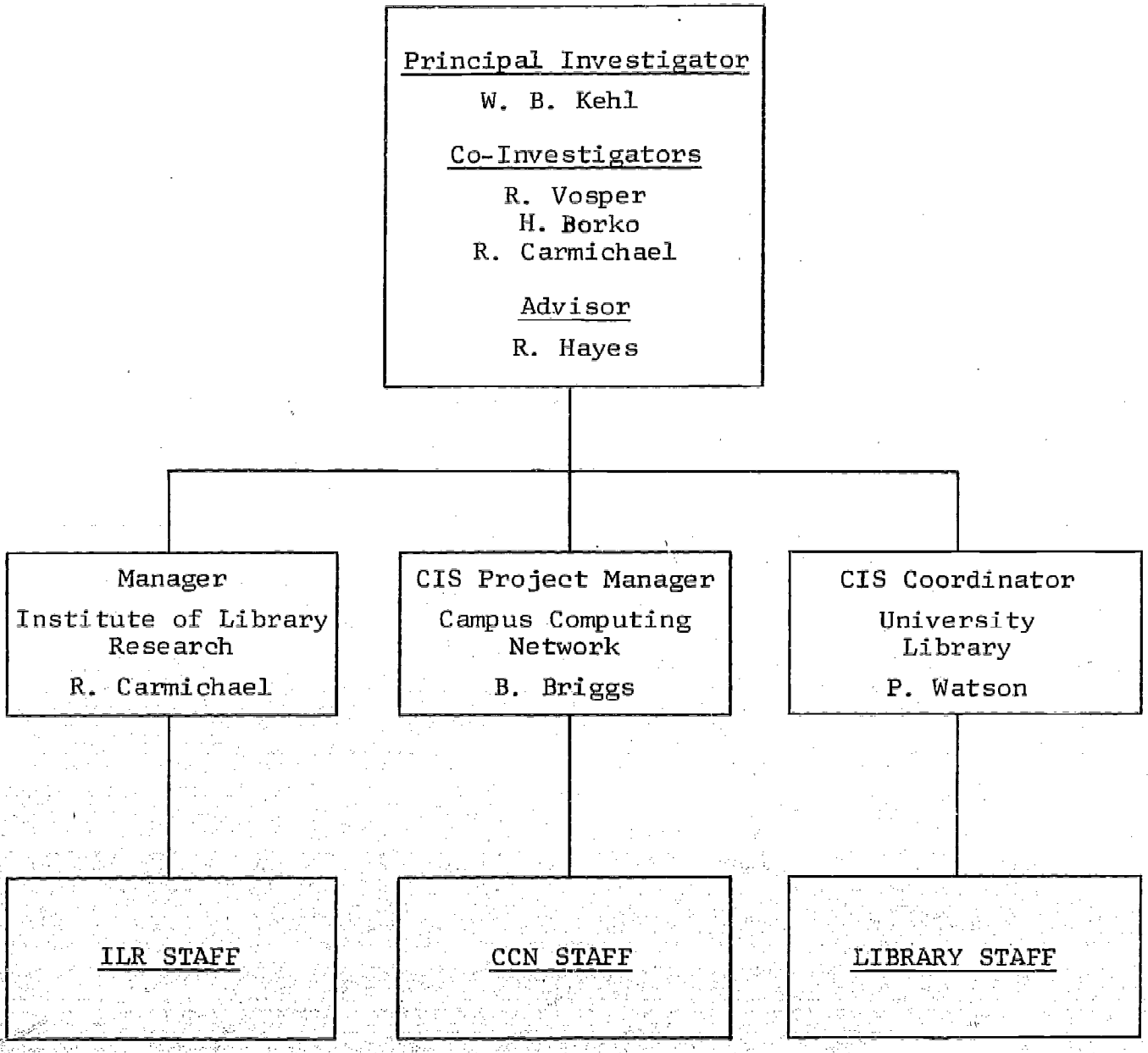
Task Management

Specific tasks, defined in Section 3 of this document, are assigned to each of the three participating organizations. One person within each organization is responsible for the tasks assigned to that organization. In some instances, the people actually performing the work may belong to one of the other organizations, or the task team may have people representing more than one organization. This arrangement worked well in Phase IIA and will be continued in Phase IIB. The keys to success are the high degree of communication and coordination maintained by these individuals and the joint dedication to the development of a Center for Information Services exhibited by all involved personnel. Project and organizational relationships are shown on Figure 5.

Robert Carmichael, Manager of ILR, will be responsible for assigned ILR tasks involving project coordination, documentation control, progress and cost reporting, and for initiating test and evaluation studies. (Funds for the latter task have not been allocated in the current Phase IIB budget.) Professor Harold Borko will coordinate the activities of the User Committees, assist in establishing criteria and procedures for evaluation, and will contribute to the design of CIS from the point of view of the University Library and the Library School.

FIGURE 5

PROJECT ORGANIZATION
UCLA CAMPUS



Peter Watson, CIS Corrdinator for the Library, will be responsible for the Library's tasks for Phase IIB. A librarian and two half-time research assistants will assist him. The Library's major tasks will be to acquire selected data bases, offer experimental services, develop operational procedures for CIS, and continue the seminar program.

Bruce Briggs, CIS Project Manager for CCN, will be responsible for the completion of tasks assigned to CCN. He will be assisted by a staff of eight programmers. The major tasks of this group will be to complete the detailed design of the IPS, to develop and operate the prototype, and to provide interim experimental services.

Cost and Progress Reporting

The basic job cost system established during Phase IIA will be used to track and control costs during Phase IIB. Monthly cumulative cost summaries will be compared to the budget schedules prepared during the detailed planning for this phase. For this phase, acquisition costs are budgeted to provide selected data bases used to test experimental services and related library and computing procedures. These costs will be reported as they are incurred, hence the actual expenditure rate may vary around the predicted rate since establishing specific acquisition plans, requirements and cost are Phase IIB tasks. Personnel budgeted for Phase IIB are shown on Figure 6.

Three mechanisms will continue to be applied to monitor and report progress. Technical meetings will be held weekly, and policy meetings will be held monthly. Intra-CIS reports (working papers, cost reports, proposed procedures, etc.) will be prepared based on a schedule to be developed early in Phase IIB. General progress summaries will be submitted quarterly to the National Science Foundation. Technical working documents will be maintained in project files and will be used to prepare the Phase IIB final report.

INSTITUTE OF LIBRARY RESEARCH RESPONSIBILITIES

During Phase IIB the Institute will be concerned primarily with administrative type responsibilities in support of CCN and Library efforts. Personnel limitations (see Figure 6) preclude broader support. Within this context, one function of the Institute of Library Research (ILR) during Phase IIB will be that of system coordination. It includes coordination of intra-CIS activities in order to insure that the tasks assigned to CCN and the UCLA Library are conducted in harmony and on schedule. It includes coordination of CIS documentation, particularly quarterly and final reports.

Another function of ILR during Phase IIB will be to open and maintain lines of communication between CIS and the user community in order to

FIGURE 6

NOMINAL PERSONNEL BUDGET FOR PHASE IIB

ORGANIZATION AND PERSONNEL	NO. OF MONTHS	NSF BUDGET	UCLA CONTRIBUTION
Campus Computing Network			
W. Kehl, Prin. Investigator	18	--	10%
B. Briggs	18	100%	--
A. de Boer	18	100%	--
P. Donahoe	18	100%	--
W. Jordan	18	100%	--
N. Kolb, Secretary	18	100%	--
N. Ludlam	18	100%	--
L. Miroff	18	100%	--
J. Pine	18	50%	--
I. Riordan	18	50%	--
University Library			
R. Vosper, Co. Prin. Inv.	18	--	10%
P. Watson	18	100%	--
(Librarian)	12	100%	--
Research Assistant	18	50%	--
Research Assistant	18	50%	--
Institute of Library Research			
R. Carmichael, Co-Prin. Inv.	18	25%	--
(Secretary)	18	100%	--
(Clerk-Typist)	18	50%	--
Grad. School of Library Service			
H. Borko, Co-Prin. Inv.	18	--	10%

familiarize the latter with CIS functions and to prepare the library staff in particular for the transition period in which they will be given control of CIS. This function will be accomplished by supporting seminars conducted for the Library staff, supporting user committees and user needs studies, and preparing brochures and newsletters explaining CIS activities. In addition, ILR will continue to maintain the inventory of available data bases, which was compiled in Phase I of the project, and will continue interface discussions with the University of California Library Systems Development Program.

CAMPUS COMPUTING NETWORK RESPONSIBILITIES

CCN has total responsibility for CIS development during Phase IIB. The capability to meet this requirement came about as follows. During Phase IIA, a component of the CIS project was established within the Campus Computing Network to develop the software needed by CIS. The primary task of this component was to develop a basic design of the Information Processing System for CIS. The status of these design efforts at the end of Phase IIA is contained in Part 3 of the Phase IIA Final Report.

With respect to specific task allocations, during Phase IIB, CCN is responsible for competing the design and documenting the specifications and the programming details for the CIS Information Processing System. The primary product of this phase will be the development of the prototype system. In parallel with this design, documentation, and programming, CCN will conduct experimental operations with existing information retrieval systems in order to get operational experience that will influence the final design and the implementation of the CIS software.

UNIVERSITY LIBRARY RESPONSIBILITIES

The major responsibilities of the UCLA Library during Phase IIB are to work with user committees to identify desired data bases, acquire and maintain selected data bases, provide experimental services to the user community, develop viable operational procedures for the Center for Information Services, cooperate with ILR to conduct seminars for working librarians and interested users, work closely with the CCN and the ILR to prepare a general system specification, and prepare for the transfer of CIS operation to the Library. The Library will also work with CCN to provide needed information specialists and profile generation assistance.

IV. PHASE IIB TASKS

TASK SCHEDULE

The major tasks and the scheduled task performance periods for Phase IIB are shown in Figure 7. For convenience of project organization, a task is listed under the group (organizational area) that has the major responsibility for that task. This organization of tasks, however, does not necessarily imply that a particular task will be accomplished totally by the group under which it is listed, but the list should provide a good guide to the distribution of activities and responsibilities. The comparable task schedule as initially proposed for a 12 month rather than the current 18 month development period is shown in Appendix A where each task is briefly defined. Under the current schedule, the design activity plays a dominant role so as to fully utilize the experienced computer programmers who already are designing, coding, testing, and documenting elements of the prototype IPS. Several of the tasks areas are discussed in the following paragraphs to indicate key areas of Phase IIA activity and to record some of the objectives and plans for the current phase.

IPS DESIGN AND DEVELOPMENT

Requirements

During Phase IIA, CCN conducted a fairly detailed study of the requirements for the CIS Information Processing System (IPS). The results of this investigation are documented in Part 3 of the Phase IIA Final Report, and are summarized below to establish criteria for use in interpreting the nature of the tasks assigned to the CIS-CCN group.

Services. The IPS must consist of a variety of services, including bibliographic, text-processing, and numerical services. Even within these services, there must be a considerable variety of subservices. For example, text-processing must include a number of services such as indexing, concordance generation, frequency counts, and others.

Data Formats. The IPS must be data-base independent. That is, it must not be structured around a few data base formats, but rather must be able to handle many existing formats as well as currently unforeseen ones.

Flexibility. The IPS must have a built-in flexibility to accept new services and functions. This is obvious since we cannot anticipate future applications of the system. We must be able to change or add components of the system without disturbing it.

FIGURE 7

PHASE IIB TASK SCHEDULE

	1971												1972					
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
CCN																		
EXPERIMENT WITH OPERATION OF INTERIM SYSTEMS	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
TEST AND EVALUATE INTERIM SYSTEMS		X	X	X	X	X	X	X	X	X								
COMPLETE DESIGN OF IPS	X	X	X	X	X	X	X	X	X	X	X	X						
DEVELOP PROTOTYPE OF IPS				X	X	X	X	X	X	X	X	X	X					
OPERATE PROTOTYPE												X	X	X	X	X	X	X
TEST AND EVALUATE PROTOTYPE													X	X	X	X	X	X
LIBRARY																		
ACQUIRE AND MAINTAIN SELECTED DATA BASES	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
DEVELOP OPERATIONAL PROCEDURES FOR CIS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PLAN TRANSFER OF OPERATIONAL RESPONSIBILITY TO LIBRARY									X	X	X	X	X	X	X	X	X	X
DEFINE ROLE OF INFORMATION SPECIALIST									X	X	X	X	X	X	X	X	X	X
CONDUCT SEMINARS FOR LIBRARIANS AND USERS											X	X	X	X	X	X	X	X
PROVIDE EXPERIMENTAL SERVICES TO USER COMMUNITY		X	X	X	X	X	X	X	X	X	X	X						
ASSIST WITH OPERATION OF PROTOTYPE													X	X	X	X	X	X
ILR																		
SUPPORT INTERFACE BETWEEN CCN AND LIBRARY	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ORGANIZE AND CONTROL CIS DOCUMENTATION	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SUPPORT USER COMMITTEES	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EXAMINE USER NEEDS									X	X	X	X	X	X	X	X		
MAINTAIN INVENTORY OF AVAILABLE DATA BASES	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Utilization. The IPS must be able to service many users simultaneously. This requirement is motivated by two factors. First, for such operations as SDI work many users must be able to batch their profiles in order that only one pass of a tape is required rather than many. Second, users will want to explore data bases in an on-line mode. Hence there are two definitions of "simultaneous" in this context: many users using one service at the same time, and many users using many services at the same time. There is a need for servicing users both in a batch processing and an interactive mode.

Instruction. The IPS should have a built-in instructional capability. This applies, of course, to an interactive mode. The instruction is intended mainly for beginning users who want to know how to use the IPS and the available data bases. Some terse instruction for more advanced users should be available as well.

Recording. The IPS should have built-in accounting and monitoring functions for the purpose of billing, monitoring and evaluating system usage, and discovering bottlenecks to system efficiency.

Usefulness. The IPS should be both efficient and cost effective. Within limits of practicality it should be exportable (i.e. usable at more than one location).

Development

The major thrust of the CCN effort during Phase IIB is the development of the information processing system prototype, which will be expanded into the complete production version in Phases III and IV. The current goal is for CCN to have completed, operated, and tested, by the end of Phase IIB, a working prototype system that contains the following components: a monitor, a request manager, service managers, process managers, and a sample of translators, analyzers, and generators. An accounting and monitoring component will be included so that evaluation can begin with the implementation of the prototype.

The implementation of on-line, interactive functions, including instructional assistance, will be accomplished in Phase III. This deferement is being made for two reasons. One, this is in itself a major task, and were it done in Phase IIB, the implementation of a prototype system would be delayed, and it is CCN's desire to begin having operational, evaluative experience as soon as is feasible. Two, it is expected that many users will be interested initially in sequential searching (most current data bases are on magnetic tape) and the interest in interactive processing will grow slowly as the batch system is being used. The data bases to be processed by the prototype will be specified during Phase IIB and as they become available will be implemented. This should be a minor task since only a read routine need be written when a new base is to be used. It is intended, however, to have the prototype system take over

the work of the experimental systems (described below), which includes searching of the Chemical Abstracts Services tapes.

General Design Approach

Design guidelines established in Phase IIA include the following:

a. The design of the IPS must ensure modularity at all levels of operation, including services, user request handling, intra-service operation, and support functions (such as monitoring and accounting).

b. All input-output functions must be isolated. This will ensure not only data-base independence, but also machine-configuration independence, insofar as possible.

c. All operating system functions must be isolated; that is the IPS should not be dependent upon particular versions of the operating system.

d. Plans must be made for a time-sharing facility and remote job entry. It is expected that use will be made of IBM's Time Sharing Option when it is released. Provisions will be made for the remote entry of jobs from a peripheral computer located in the Library.

e. An independent, functional component of the IPS will provide interactive assistance for the on-line user. ILR already has developed such a program, called DISCUS, and we shall consider the use of that existing program.

EXPERIMENTAL OPERATIONS

In parallel with the designing, documentation, and prototype development CCN will conduct experimental operations with interim software to obtain valuable information concerning real-time operational problems and procedures, evaluation and monitoring techniques, user interface problems, and the quantity and quality of services needed. This information will have considerable influence on the detailed design and implementation of all parts of the prototype system. Both ILR and the Library will help in providing experimental services to the user community.

Most of the experimental operations will center around the use of IBM's TEXT-PAC system in providing SDI and retrospective searches of the Chemical Abstracts Service CA-Condensates File. As other data bases become available, TEXT-PAC will be used to process them. It is planned that the prototype system will take over this work before the end of Phase IIB (see Figure 7).

During Phase IIB, the project will get practical experience with numerical processing by experimenting with the tapes from the 1970 Census. CCN has met with SCRIS (Southern California Regional Information Study) to consider using their programs as interim software; other solutions also are being explored (such as contacts with DUALabs, Inc. through the Library's participation in a CRL-Ford Foundation cooperative project). The UCLA Library has had extensive discussions on all aspects of the Census and will be working closely with CCN. The modular retrieval program developed in Phase IIA (see Part 1 of Phase IIA Final Report) also will be used to provide searching, indexing, and processing of the ERIC file for a selected group of users to acquire additional data to guide prototype development.

COORDINATION AND COMMUNICATION

Coordination

ILR will follow closely the progress being made on the tasks being conducted by CCN and the Library. This will be done by personal contact with the respective staffs, by discussions in both formal and informal meetings, and by monitoring the documentation produced by the two groups. Coordination will be enhanced by suggesting ideas to CCN and the Library based on the experience and expertise of the ILR staff, and by filtering inputs from user committees and other CIS committees (see below) to appropriate members of CCN and the Library. ILR will assist the Principal Investigator by preparing the quarterly progress reports submitted to NSF and will monitor and summarize cost data for inclusion in the reports. ILR also will assist with system test and evaluation activities through review and consultation (but is not staffed to perform all tasks outlined in the Phase IIB Supplement to the Phase II Proposal for the Development of a Center for Information Services).

Communication

Several techniques will be used in Phase IIB and succeeding phases to strengthen communications with the user community, to inform and involve library personnel in CIS activities including design support and procedure preparation, to interface with other University of California libraries, data sources, and developments, and to interact with other data base and computer program resource locations. Seminars based upon those held in Phase IIA will be conducted, action will be taken to locate data bases and determine user interest, and user committees will be asked to increase their level of involvement.

SEMINAR FOR LIBRARY STAFF

The evidence from Phase IIA indicates decisively that the idea of mounting seminars for working librarians is a good one and worth further

investigation as a permanent part of the library's involvement in the field of mechanized information services.

The seminars held in Phase IIA had a twofold purpose:

a. To acquaint library staff with the nature and scope of machine readable information, and with the implications of having the library act as the responsible agency for acquiring and providing services from them.

b. To have the librarians act as a body of consultants, providing the project staff with qualified input towards the task of designing specifications for a system that will be viable for the UCLA Library environment.

Phase IIA seminar experiences are discussed in considerable detail in Part 6 of this Final Report

In Phase IIB, it is foreseen that there will be a need for at least one and possibly two more such seminars, though their function may by then have changed somewhat (the work of specification being essentially complete). Bearing in mind that there is a growing demand for this type of seminar to be given in other libraries, there are a number of suggested directions that such seminars could take:

a. The 10-week presentation could be condensed to 2 weeks (full time attendance).

b. The 2-week format might in turn be condensed to a crash program of, say, 2 days.

c. In this version, the seminar might then become a travelling presentation, rather than fixed at UCLA.

d. Or, the lectures might be put on videotape and distributed.

Any one of the above configurations might best be handled by some agency other than the UCLA Library (e.g. the University Extension or a commercial organization) in which case the Library would just be one of a number of organizations that sent participants. It may be, however, that the Library has sufficient need for the seminars on a permanent basis to continue to run its own. A shortened version of the seminar could continue in use as a medium of instruction for Library Staff; to provide an introduction to the Library's range of data base holdings and services for new graduate students, interested faculty, committees, etc.; and to provide a forum for Library Staff to meet with representatives of data bases potentially suitable for acquisition, by incorporating a guest presentation into the standing contents of the seminar.

V. USER AND OTHER PROJECT COMMITTEES

USER NEEDS

CIS development is focused on the needs of the user. On one hand, the user's needs must be met by involving him in the planning and development of the system. On the other hand, the system must be created before the user can confidently project actual needs. This latter restriction must be faced in the development of all information processing systems. The user must actually use the new tools and techniques in order to reformat his intellectual attitudes and traditional approaches. Then with experience and understanding he can better define current and future requirements--a situation often calling for system redesign and update. In this sense the CIS development must be viewed as an ongoing activity that continually strives to anticipate and met changing demands, requirements, and environments.

A system that acquires data but is not responsive to user needs serves only an archival function. By contrast, CIS is user oriented and provides, or interfaces with, those functional activities required to help the user locate appropriate data bases and search for and acquire needed information. To meet these needs, the system must develop procedures for responding to user demands. The process of acquiring and housing data bases will sometimes require that CIS serve as a resource collection point before user pressure is felt. Users must be made aware of available resources, tools, and procedures through planned activities and announcements.

COMMITTEES

A number of committees were established on the UCLA campus and within the UC system during Phase IIA to guide CIS development. Three policy committees (the Management Committee, the Library Liaison Committee, and the Extra-Campus Committee) provide advice on policy issues; the several technical committees (not all appointed) continue to address technical issues such as text processing, file management, hardware evaluation, and on-line processing; and the User Committees not only provide information, guidance, and support but also participate actively in data base selection and, where possible, in the experimental utilization and evaluation of system services. Other committees established to consider data base problems are also deemed to be valuable CIS resources.

Membership

Committee membership as recorded during Phase IIA is shown by Figure 8. During Phase IIB, however, the composition of such committees will vary to

FIGURE 8

C.I.S. Committees

April 1970

A. POLICY COMMITTEES

1. Management Committee

R. M. Hayes, Director, ILR
W. B. Kehl, Director, CCN
R. G. Vosper, University Librarian

2. Library Liaison Committee

Paul Miles, Assistant University Librarian (Chairman)
Everett T. Moore, Assistant University Librarian
Anthony Hall, Head, Library Systems Staff
Mary Ryan, Head, Public Affairs Service
Robert L. Collison, Head, Reference Department
Lorraine Mathies, Head, Education and Psychology Library
Johanna Tallman, Head, Engineering and Math-Sciences Library
Frederick E. Smith, Head, Law Library
Nelson Gilman, Assistant Biomedical Librarian
Judith Corin, Head, Physics Library
Pat Walter, Brain Information Service

3. Extra-Campus Committee

Anthony Hall, Head, Library Systems Staff, UCLA (Chairman)
Herb Ahn, Head, Library Systems Analysis Office, Irvine
Scott Buginas, Library Manager, Lawrence Radiation Laboratory, Livermore
Kay Forrest, Assistant University Librarian for the Sciences, Riverside
Ming-Yu Li, Documentation Specialist, Davis

B. TECHNICAL COMMITTEES

1. Text Processing Committee

Professor Harold Borko, School of Library Service (Chairman)
Professor Vinton Dearing, Department of English
Professor David Packard, Department of Classics
Martin Kaye, Department of Linguistics

FIGURE 8 (continued)

2. 2. File Management Committee

To be announced

3. Hardware Evaluation Committee

To be announced

4. On-Line Processing Committee

To be announced

C. USER COMMITTEES

1. Social Sciences User Committee

Professor Dwaine Marvick, Department of Political Science, Chairman
Professor Marvin Hoffenberg, Department of Political Science
Professor Carl Hensler, Department of Political Science
Professor Peter Kamnitzer, School of Architecture & Urban Planning
Mary Ryan, Head, Public Affairs Service

2. Education and Psychology User Committee

Dr. Lorraine Mathies, Head, Education and Psychology Library, Chairman
Professor Arthur Cohen, ERIC Clearinghouse for Junior Colleges
Professor Jerrold Novotney, Graduate School of Education, (representing Dean John Goodlad)
Professor Marvin Alkin, Center for the Evaluation of Instruction
Professor Kent Dallett, Department of Psychology
Professor Ronald Freeman, Department of English

3. Physical Sciences and Engineering User Committee

Johanna Tallman, Head, EMS Library
Professor George Igo, Physics
Professor Ronald Shreve, Geology
Professor Rointan Bunshah, Engineering
Professor Frank Spaid, Engineering
Professor David Evans, Chemistry

FIGURE 8 (continued)

4. Life Sciences User Committee

Louise Darling, Head, Biomedical Library, Chairman
Professor Peter Amacher, Medical History and Physiology
Professor John Belkin, Zoology
Professor Donald Jenden, Pharmacology and Biomathematics
Professor Frank Massey, Biostatistics and Biomathematics
Professor Richard Riley, Radiology

5. Law User Committee

Frederick E. Smith, Head, Law Library, Chairman
Professor Reginald Alleyne, Law
Professor Lawrence Sager, Law

D. OTHER

1. University Librarian's

Faculty Committee on the 1970 Census

Dean Harold Somers, Economics
Dean Harvey Perloff, Architecture and Urban Planning
Dean L. S. Georke, Public Health
Professor Robert M. Hayes, Institute of Library Research
Professor George Sabagh, Sociology
Professor Werner Hirsch, Institute of Government and Public Affairs
Professor Bertram Bussell, Engineering
Professor Marvin Hoffenberg, Political Science
Professor Dwaine Marvick, Political Science
Professor Y. P. Chen, Economics
Mr. William Kehl, Campus Computing Network

Working Subcommittee on Policies for Procurement and Use of the Census

Professor Bertram Bussell, Chairman
Professor Y. P. Chen
Professor Robert M. Hayes
Mr. William Kehl
Professor Dwaine Marvick
Professor Frank Massey

reflect personnel changes and new assignments. For example, the Management Committee composition for Phase IIB (1/71 - 6/72) is:

CIS Phase IIB Management Committee

William B. Kehl, Director CCN, (Chairman)

Robert G. Vosper, University Librarian

Harold Borko, Professor,* (Advisor to ILR)

Robert L. Carmichael, Manager ILR

Robert M. Hayes, Professor,* (Advisor to CIS)

Several members of the Library Liaison Committee, themselves heads of UCLA campus libraries or assistant university librarians, serve as chairmen of the identified User Committees. Other committees are headed by interested and qualified members of the academic staff. Committee members are drawn from these two groups. The User Committee also serves to link CIS with the traditional departmental faculty-membered library committees.

Utilization

User committees are indoctrinated by CIS and library personnel: first, so that committee members can provide sound guidance to the UCLA Library in the form of information leading to an explicit program for the acquisition of data bases; secondly, so that the committees can provide input needed to generate a list of priority-ordered experiemental services to guide CIS development planning and experimentation by project personnel; third, to provide communication links to their departments to help identify the users; and fourth, so that eventually they will become an advisory body for the operational system.

Throughout the project, user committees will be utilized to support:

- System Development
- Data Base Acquisition
- Data Base Utilization
- Announcement and Indoctrination
- System Test and Evaluation

They will be called upon to support system development by helping identify requirements, procedures, and guidelines; and by participation

*Graduate School of Library Service.

in and evaluation of experimental services. They will help acquire data bases through the processes of identifying specific data bases needed for teaching, research, or grant support; participate as needed in the actual negotiation process for acquisition; and help locate data bases owned by individuals in the departments and arrange for these data bases or master copies to be deposited in the CIS inventory--thus making such resources available to a wider audience of potential users. In addition to data bases formally acquired, considerable use will be made of user committees in helping determine which new data bases--created by processing already acquired data bases--are to be designated and handled as system resources. User committees will support data base utilization in at least three ways: exposure to search profile generation procedures so as to become better acquainted with system techniques; planned use of data bases as teaching aids or for class assigned activities; and for members of the committee to initiate programs of planned research--either as an individual investigation, intramurally funded research, or extramurally funded grants or contracts.

The user committees will be used to implement the announcement and indoctrinations functions. These traditional library services, thus augmented, are needed to insure that potential users are made aware of the Center for Information Services, its capabilities, its resources and its procedures. Another most important way in which user committees will support CIS development is to participate in system test and system evaluation activities. These two items insure first, that CIS as implemented is capable of servicing user needs in a satisfactory manner; secondly, through evaluation, areas of the system needing improvement are identified. User committees also will be used where appropriate to strengthen ties with users and user committees established on other University of California campuses.

VI. DATA BASE CONSIDERATIONS

BACKGROUND

A major part of the work of specifying procedures by which the library can handle machine-readable data bases consists of supplying an answer to the question "How much concession shall be made to the form, the medium, in which these information stores are appearing?" By and large it is the form in which computerized data is embodied that gives the library a problem. The actual information, as was recognized several years ago, is relatively easier to deal with, for in most cases it is information that has an existing counterpart in print (c.f. Chemical Abstracts, MEDLARS, ERIC and many others). Furthermore, the work of Lubetzky, as reflected in the 1967 Anglo-American code of cataloging rules, has made this distinction an overt one in general library practice, to the benefit of all concerned.

To gain a perspective on the way the UCLA Library system responds to differences in the medium of information transmission, it is necessary to remember that the Library is presently receiving three main types or classes of material--books, serials, and microforms. And the technical processing procedures are structured around their form rather than their content. In the UCLA University Research Library, for example, the Acquisitions section (which deals primarily with books and monographs) has a specific sub-unit for microforms, while serials publications are processed by a Serials Department. Cataloging is integrated into a single department, but it has clearly identified sub-units for different forms of material. Likewise, public service aspects are to a degree treated according to the medium of publication, with separate service points for serials and microforms.

APPROACHES

One possible solution to the problem of how the Library shall process machine readable data bases is immediately evident--it could be done on the basis of form. This would in fact be consonant with the trends just outlined. Particularly if one looks at the colossal development of periodical publications in the last 50 years, there are reasonable grounds for assuming that a separate unit within the Library, oriented to this particular medium, may become the ultimate, settled solution. However, there are many pressing reasons not to begin the integration of tapes into the Library by taking that assumption as fact. In the first

place, to establish entire new units (UCLA is effectively a system of 19 libraries with three primary nodes) would be enormously expensive, without any guarantee of added efficiency or competence. Second, it would be an obvious tactical error to impose on the library a new set of procedures, specified from the outside by a professional research group. Third, and undoubtedly more important in the long term, to do so would be implicitly to admit that machine-readable data bases cannot in fact be dealt with by existing library procedures, or any viable modification of them, and that existing library skills are, for all practical purposes, useless. This comes close to negating the basic postulate of this project that the library is the agency best fitted to take this responsibility precisely because of the information handling expertise of its staff. There are other contributory factors which need not be explored here, such as the probable effect this would have of confirming some librarians' worst fears about 'the computer'.

Conversely, it is not to be expected that the best method of solving the many complex questions of data base servicing will be to make no concessions to the new and (to librarians) unfamiliar format. To attempt to rely, for example, wholly on the existing 10-part order form (3x5 inches) for acquisition would be to invite a number of sizeable problems, both administrative (clerical) and intellectual (bibliographic) and implicitly to deny that data bases are a special phenomenon demanding a carefully phased program of research and development: obviously this too would be counter to the entire thrust of the CIS project since its inception in 1966.

It appears that the most rational operational patterns for handling tapes in the near future will be centered upon the practising librarians, with support (on a quasi-consultative basis) from members of the CIS project. And this function is expected to decline once this particular historical situation is past, and library schools have sent out several generations of students with a thorough grounding in mechanized information processing. But for the present, the various novel features of computerized information storage and retrieval will mean establishing shared work patterns, probably on a basis of day-to-day co-operation, between CIS personnel in the Library (operating initially through the Systems Department) and librarians in the relevant areas of acquisition, cataloging, reference and perhaps also circulation. The two seminars held during 1970 ensure that at least one individual (usually more) in each of the various departments has had some exposure to data bases and the handling of mechanized information. At this time it is sufficient to note that the basic pattern of close co-operation between project staff and UCLA librarians, with the underlying emphasis on the latter, will be taken as understood during the discussion of the following tasks.

TRIAL ACQUISITION OF DATA BASES

During 1971 the Center for Information Services will work closely with the UCLA Library staff to establish procedures, criteria, and

guidelines for acquiring the first data bases for actual service. Heavy reliance will be placed on available information, faculty judgment, related University developments, and the nature of the file.

Existing Bibliographic Information

Since no bibliographic network comparable to that used in book selection yet exists for machine readable data bases, this information will in general be drawn from files in the Institute of Library Research. These have been maintained for over three years with precisely this end in view--to provide a body of such information as does exist (publishers' announcements, clippings from the professional journals, sample search forms, lease or purchase agreements, personal letters, and any other bibliographic data that is available, plus some technical documentation) on which to make intelligent acquisition decisions.

Judgment of Faculty

As described in the Third Quarterly Progress Report on Phase IIA (April 1970) of this project, and in the User Committee section of this document, a series of CIS User Committees has been established as a vehicle for broad-based communication with the entire UCLA faculty and their needs, preferences, and expectations regarding both the informational content of data bases and the range of services to be provided from them. To ensure close liaison at a senior level, the Head of the disciplinary library serves as a member (usually, in fact, as the Chairman) of the respective CIS User Committee.

Universitywide Situations

Related developments already underway at several University of California campuses make it imperative that the acquisition of data bases be viewed in the context of the whole University. For example, the Library at UC Riverside has been providing an experimental SDI service from Chemical Abstracts tapes for over a year, and is planning to extend its coverage to Biological Abstracts in the near future. The Library at UC Davis, a campus with strong research priorities towards the agricultural sciences, is actively exploring the acquisition of the National Agricultural Library's CAIN tapes that contain catalog data. At UC Berkeley, the Institute of Governmental Studies and the Survey Research Center have jointly agreed to form a Summary Tape Processing Center for the 1970 Census files. Of these and similar developments in the UC system, the selection decision for UCLA's Center for Information Services will have to take account. This should not limit our freedom of choice, nor need it place constraints on the design of a CIS for UCLA--but it will serve to ensure that large sums of money are not expended in unnecessary duplication of resources, especially where UCLA's usage of a particular file can be projected to be minimal in the immediate future (e.g. the CAIN tapes).

Nature of File

The Center for Information Services is being created with the intention that it will eventually become a library service for the whole campus community at UCLA. As such it is being designed to handle all of the three major types of data base currently being produced--bibliographic reference files, numerical data files, and full text files. At this stage, however, it is proposed to continue to focus our efforts upon the two primary subsets: scientific and technical data bases; and bibliographic reference data. While not excluding other data bases for which a pressing need may occur, we anticipate that by the end of 1971, the CIS should be in a position to offer experimental services from a modest set of files that will include some of the following data bases:

Chemical Abstracts
Biological Abstracts
American Institute of Physics' SPIN tapes
Institute of Electrical and Electronic Engineers' REFLECS tapes
MEDLARS
Engineering Index
Clearinghouse for Federal Scientific and Technical Information reference tapes (USGRDR)
Psychological Abstracts
Nuclear Science Abstracts
U.S. Census of 1970
Dissertation Abstracts
ERIC (RIE and CIJE)

However, in order to maximize the chances of mounting a viable test service at a reasonably early date (i.e. in calendar 1971) it is foreseen that another criterion might be influential upon selection, namely the technical difficulty of the file. For example, if the faculty have to choose between two fairly costly data bases, each of more or less equal usefulness, the degree of programming difficulty (of a complex file like Nuclear Science Abstracts, for instance) might then become a factor for consideration.

TRIAL CATALOGING OF DATA BASES

Cataloging will be accomplished according to routines developed during Phase IIA. Preliminary findings from the CIS Seminars for library staff indicate that librarians believe that cataloging procedures for data bases can be closely integrated with the regular cataloging workflow, and that they desire that this be the situation. Amongst other things, this will entail the provision of a tape "read" for use by the cataloging staff; the utilization where possible of the Anglo-American cataloging rules; and the appearance of catalog data in the central (Research Library) catalog plus whichever branch library may be most directly affected by service requests for a particular data base. Formal procedures will be documented in Phase IIB.

TRIAL SERVICE FROM DATA BASES

Service to users is a serious concern of CIS and much remains to be done, not only in providing services but in defining the services to be provided. The following paragraphs illustrate some of the issues and approaches considered to date.

During Phase IIA, a prototype tape lending service was initiated on an ad hoc basis by the Library to cope with user needs which were already arising in advance of the Library's ability to offer a processing or CIS-type service. The item in question was the 1970 Census Test tape (first count) with which ILR and the Library Systems staff had been experimenting. The procedure was quite simple; the data was copied for the borrower and the returned tape treated as a scratch tape. Solutions such as this will be investigated in Phase IIB, not because it is a proposed design solution for CIS, but because it does fill a definite temporary need and was created out of necessity. What is not known is how temporary, or conversely, how permanent, this type of service is destined to be. Is the demand to "borrow tapes" in fact likely to atrophy with the advent of CIS processing services, or to persist? If it persists, what are the causes? Do the clients need types or levels of processing on the tapes which CIS cannot provide? If so, what are they, and why not, etc.? Will such a lending service lead to an unbearable tape copying burden on the Library's computer? Will there be an unacceptable copyright problem involved in supplying copies? What are the copying costs, and what would be a realistic copying charge? These and other questions will only be answered by actual experience.

From the project viewpoint, it is intended that the processing services offered by CIS be announced and made available by the Library as they are developed and debugged by CIS technical staff. In Phase IIB, the reference librarians will work closely with CIS library staff to analyze incoming requests, transcribe them into a canonical form, and then scrutinize the output and maintain contact with the user to obtain regular and detailed feedback. The preliminary set of forms for the user-librarian interface is currently being designed; obviously, a most important part of the librarians' work in this phase will be to test the suitability of these forms, and recommend changes as necessary. Members of the CIS User Committees, being the best generally informed segments of the faculty, will be among the first serious users of the system, and their feedback will be a critical indicator of the success of the initial services. System monitoring procedures will be developed and clarified, and close liaison will be maintained between project staff assigned to the Library and those assigned to the Campus Computing Network.

VII. PROCEDURES

ACQUISITION PROCEDURES

The trial set of data bases will be selected and acquired using the mechanisms and procedures specified in Phase IIA and to be refined in Phase IIB. Experience gathered during both Phase I and Phase IIA indicates that the four probable types of arrangement whereby a Center for Information Services could offer access to needed data bases include: purchase, subscription, service from a remote facility, and on-line access to a remote facility.

Outright Purchase

Examples of data bases purchasable outright are U.S. Census Tapes, files of "raw" numerical data, and machine-readable thesauri to be used in association with another file. Where the manufacturer of a data base provides an order form, the trial procedure will call for it to be filled out by the Acquisitions librarian, working with the responsible CIS staff member. Investigation will be made of the general applicability of these forms, and of the feasibility of designing one Library order form which could supplant the many and diverse forms currently used by manufacturers. (Possibilities of an American Library Association standard also will be explored.) Concurrently, the Acquisitions Department will be investigating the scope and limitations of the existing 10-part order form for data base acquisition.

When the data base arrives, it must be checked before it can be accepted and payment made. (Payment in advance, now being tried by some data base manufacturers, probably will not long survive once acquisition becomes an operational library function, since it is contrary to basic library practice.) Procedures designed in Phase IIB will emphasize payment on receipt, thus committing the project and the library to develop workable checking procedures. The initial section of the tape, or random samples of a multi-reel data base, normally will be printed as soon as the data base arrives. The procedure for this is expected to center initially on the Library's IBM 360/20 computer; however, a more general solution awaits definition. (The IBM 360/20 cannot manipulate records exceeding approximately 2000 characters.) The contents having been verified, a form--perhaps in this stage of the project a duplicate of the Acquisitions Department 'on order' form with additional information from CIS records--will be sent to the Catalog Department, and CIS files will be updated accordingly. As a general rule, the internal forms

which are necessary for the UCLA Library's bookkeeping operation will be completed and filed in the present manner and at the appropriate times. For example, the payment from the CIS budget to the Library's budget for services or acquisition cost could be handled as two transactions--January 1971 for the latter half of FY 70-71 and July 1971 for FY 71-72.

No reliable guide exists as to when, and how, the technical documentation of the file will arrive: it has been known to precede, accompany or follow the file, in sections or as a whole. Often it is updated by loose-leaf sheets that might be received at any time. These documents will need to be accession stamped, and recorded in the Tape Documentation file. The CIS programming staff, either at CCN or in the Library, will need to use them forthwith. After a suitable interval it may be made available to the public on demand, for on-the-spot consultation only or for copying purposes. Other ideas to be further explored are: procuring, from the manufacturer or by Xeroxing, a standard number of copies of the documentation for deposit in specific locations (e.g., URL, CCN, a branch library); and cataloging the documentation as regular library material.

Subscription on a Serial Basis

This procedure will be used to acquire the abstracting and indexing serials in magnetic tape form; also, occasionally, actual journals, such as the Journal of Chemical Documentation. The procedure in many cases will follow the basic sequence for straightforward purchase, with two main variations that will need to be investigated in Phase IIB.

The first variation concerns the integration of the acquisitions (and, to a lesser extent, cataloging) records with those of the existing Serials Department. The basic question, which is not yet solved, but of which the UCLA Library is now aware, is "would serials tapes be better handled by the Serials Department, with its claims procedures, its distinct set of forms, and its existing control over the printed counterparts of data bases such as Chemical Abstracts, Engineering Index, etc.?" Whether such advantages would be offset by the necessity of establishing two sets of acquisitions procedures for tapes needs investigation.

The second area of concern is that of lease agreements, such as are now operative for Chemical Abstracts, IEEE REFLECS tapes, etc. Joint procedures will have to be evolved to enable the Library Administrative Office to scrutinize suggested lease agreements before any firm commitment to acquisition is made. The concept of single-point acquisition by any one of the nine UC campuses will be further explored. At the moment it appears that some of the agreements being demanded by the manufacturer embody several new precedents regarding copyright and ownership. Close examination of all lease agreements is therefore especially necessary before the Library can obligate itself to accept and maintain ongoing services.

Service from a Remote Station

This type of access takes account of the fact that some data bases from which UCLA scholars will require a service may not be available for actual possession by the CIS through purchase or subscription, an example being the Dissertation Abstracts DATRIX service. A service arrangement is thus necessary, which at present customarily involves batch access to the file, with the owners accepting formulated or semi-formulated search requests, retaining exclusive control of both the data and the programs by which they will search it, and mailing to the client the printed results of the search. In this sense, the possibilities of co-operative service between UCLA and other UC campuses will continue to be explored--this will have value both in and for itself, and also as a model for future developments in this direction, either within the UC system or outside it. Because in principle it seems obvious that the user of CIS services should not have to concern himself with where the data might happen to be located, procedures will need to be developed to enable reference librarians to act as the interface just as they now do for interlibrary loans. Within a relatively short period, reference librarians should be able to handle on-line requests through the use of a terminal in the library (the UCLA Biomedical Library already has a CRT terminal for on-line querying of its own serial holdings).

On-Line Access to a Remote Facility

For some operations, this advance in access technology will replace the approach described above where the distant owner of the remote data base processes the request. In other instances, the remote data base will remain inviolate as far as remote query is concerned. With regard to on-line access and remote query, only a few working examples of this mode of access can presently be cited; the UCLA MEDLARS Station now has direct access by teletypewriter to the Abridged Index Medicus file stored at the System Development Corporation in Santa Monica (the AIM-TWX System). This is not strictly a matter of direct concern to CIS because the MEDLARS operation is a separate entity funded from other sources. The CIS responsibility exists to the extent of establishing an interface with the MEDLARS station--by what techniques the patron is then served may remain outside the CIS frame of reference. Initially this is how cooperation within the UC system or the local geographic area will evolve, although a long range goal is certainly the ability to tap into or participate in some kind of national network such as is envisioned by EDUCOM. During Phase IIB, the prospects for converting some of the remote batch operations into on-line file manipulation must be investigated.

INVENTORY PROCEDURES FOR ACQUIRED DATA BASES

Records

Current plans call for two parallel sets of records to be kept--one by the Acquisitions Department, to match as closely as possible its

existing files, and one by the CIS office. Investigation will be made of the alternative strengths and weaknesses of various systems of forms generation and control, including the possibility of creating one machine-readable master record from which any others could be drawn. The postulated set of files to be maintained by CIS is described below, and the data elements that might appear on forms in those files are listed in Figure 9.

Proposed CIS Files

The files tentatively identified during Phase IIA are described below.

Data Base File. Consisting of all the publicity and informational literature about all of the data bases that can be traced. Later, a separate file might be established for overseas data bases, organized by the given name of the data base.

"On Order" File. Capable of accommodating about 100 entries; the opening operational phases will see this fill rapidly, but for some years to come it is doubtful whether more than 100 data bases will be on order at any one time. Organized by the given name of the data base.

"Item Received" File. Contains one copy of the order form and invoicing for every completed transaction; initially with space for 500 entries. Organized by the given name of the data base.

Vendor File. Contains space for 500 entries. This will take longer to fill than an "item received" file of the same capacity--but there is no logical reason why each data base should not have a different manufacturer. Where the manufacturer is not also the vendor (i.e., where a dealer is involved) the entry should be under the vendor with cross-reference from the manufacturer. It should contain the postal address of the vendor, including the names and addresses of his key personnel associated with sales of data bases (e.g., his West Coast representative). Under this, a brief statement of any discount or approval or other service arrangements, followed by a chronological listing of the data bases we have purchased from him, showing cost.

Tape Documentation File. This file contains:

a. a copy of the original documentation accompanying the tape,

b. a report by the CIS staff member responsible for initial work such as opening the tape and identifying the elements of its structure,

c. any relevant printout associated with (b), e.g., the dump, the read routine (plus the card deck) and a specimen of the correctly formatted printout,

FIGURE 9

PROPOSED CIS FILES

Data Fields in Proposed CIS Files	Master File	CIS Holdings File	On Order File	Item Received File	Vendor File	Public Catalog
Manufacturer	X	X	X	X	X	X
Address	X	X	X	X	X	X
Issuing Agency (if different)	X	X	X	X	X	X
Title of data base	X	X	X	X	X	X
Assigned name of data base	X	X	X	X	X	X
Year of issue	X	X	X	X	X	X
Years of coverage	X	X	X	X	X	X
Number of reels	X	X	X	X	X	X
Number of logical records	X	X	X	X		X
Increment in reels/year	X	X	X	X		X
Number of logical records	X	X	X	X		X
File Organization	X	X	X	X		X
Associated Files	X	X	X	X		X
Lease or Purchase	X	X	X	X		
Basic price	X	X	X	X		
Other Factors (Discount?)	X	X	X	X		
Fund	X	X	X	X		
Authorized by	X	X	X	X		
Countersigned by	X	X	X	X		
Order number	X	X	X	X		
Makers documentation	X	X	X	X		
Equipment on which created	X					
Density (b.p.i.)	X					
Tracks, parity	X					
Recording mode (BCD, EBCDIC)	X					
Record format	X					
Block length	X					
Tape label(s)	X					
Call number	X	X				X
Subject headings	X	X				X
UCLA holdings	X	X				X
Programs available	X	X				X
Copying restrictions	X	X				X
Remarks	X	X	X	X	X	X

d. any technical correspondence resulting from (b), e.g., to the owner or to another UC campus, itemizing gaps in the original documentation, etc.,

e. later work as it occurs, roughly in the same mode, i.e., a report of what was done or attempted plus some sample printout. Any relevant contributions by users should be included, with acknowledgments and references.

In addition to the above files, the CIS as a whole will need a publicly available record analogous to the serials list. This file, again with space for about 500 entries initially, would be created after the cataloging is all completed and the data base announced for public use; the aim would be to have an alphabetic list of the data bases in the system that would show all necessary details of both physical and intellectual location. It might be called the CIS holdings file, and it would be the working record which the reference librarian would have immediately available to help meet inquiries. In other words, it would provide a means of avoiding the chore of looking through the whole of a card catalog, though derived directly therefrom.

AVAILABLE DATA BASES INVENTORY PROCEDURES

The task of compiling an inventory of available data bases, with emphasis on those most likely to be acquired by a library-based Center for Information Services, was one of the most useful components of the Phase I study of this project, as the continuing demand for that segment of the Final Report amply confirms.* Some updating has since been carried out for internal project information in Phase IIA. Two desiderata now appear:

a. The Inventory of Available Data Bases should be thoroughly updated on a national scale by actively approaching manufacturers for current information, and should then be inserted (as a file) into the Library as the basic bibliographic tool for CIS acquisitions.

b. An inventory should be compiled of all data bases currently held (by any agency) at UCLA, and then a similar project should cover the whole UC system, thus generating in effect a union catalogue. It has been suggested that the CIS Extra-Campus Committee would be an appropriate body to undertake this latter task. A draft form prepared by this committee in anticipation of such an effort is shown on Figure 10.

The procedures by which the inventory data will be collected and maintained will be finalized during Phase IIB.

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* "Inventory of Available Data Bases" by Joan C. Troutman. Part 4 of the Final Report on Mechanized Information Services in the University Library. Los Angeles, ILR, December 1967.

FIGURE 10

DATA BASE QUESTIONNAIRE

NAME OF DATA BASE: _____

SUPPLIER: _____

ADDRESS: _____

_____

CONTENT: _____

_____

SUBJECT COVERAGE: _____

TYPE OF DATA: _____

FORM:

Magnetic tape	☐	Printed	☐
Disk	☐	Microfilm	☐
Paper tape	☐	Other	
Punched card	☐		

TAPE INFORMATION: Track: _____ Character set: _____

Header: _____ bpi: _____

Coding: _____

HARDWARE INFORMATION: (Please briefly state hardware configuration required including peripherals and core requirements.)

_____

_____

_____

SOFTWARE INFORMATION:

Operating system required: _____

Programming language: _____

Available from supplies YES_____ NO_____

Cost: _____

Produced locally YES_____ NO_____

Cost: _____

DATA BASE QUESTIONNAIRE
Cont'd

FIGURE 10 Continued

She

ORIGIN: Owned by: _____

Leased or Purchased or Created on our campus ☐

Annual lease $_____

Purchase price $_____

Restrictions on use: _____

HOLDINGS: Where stored: _____

Currently subscribing? YES_____ NO_____

Number of years of backfile_____

Number of reels in backfile_____

USER INFORMATION:

Availability (To whom available): _____

Can be copied? YES_____ NO_____

Copy cost: $_____

Direct inquiries to: Name: _____

Department: _____

Campus: _____ Telephone: _____

Authorship (If locally developed): _____

Number of users_____

Are all users on your campus? YES_____ NO_____

If not, please list users' organization and locations

_____ _____

_____ _____

_____ _____

Please return this form to: Name: _____

Department: _____

Campus: _____ Telephone: _____

VIII. DOCUMENTATION CATEGORIES

IDENTIFICATION

The development phase of the CIS system from concept through implementation requires that certain individual products (computer programs, hardware, and documents) be identified and prepared or procured in accordance with agreed upon schedules. These products, often referred to as "end items", represent specific expenditures of time, manpower, and money. Such parameters can be expressed on a PERT or Milestone chart and the associated tasks and rates of accomplishment can be tracked manually or automatically by computer. The problems of accounting are significantly less complex than are the judgments that determine the assigning of values such as degree of completion or accomplishment, level of difficulty, or impact of failure.

A good system of documentation is absolutely essential. Four important categories of documents are:

a. System Specification, System Testing, and System Description documents.

b. End Item Specification and Testing documents.

c. Supporting Documentation which encompasses procedures, standards, guides, handbooks, and manuals.

d. Development Schedules, Progress Reporting, and Planning documents.

Documents such as the above are not developed by surmise, conjecture, or conceptual thinking alone. They serve to guide as well as record the results of a significant array of activities including inquiry, design, construction, test, operation, comparison, examination, and experimentation. These and related activities are initiated or conducted as a result of, or in support of, system analysis, operational evaluation, research studies, system synthesis, and concept development. From these efforts come the information and understanding that is used to create specific system requirements, design specifications, tested design solutions, and operational and maintenance guidelines. Properly organized and recorded, the resulting set of documents provides the needed insight and guidance to identify and pursue serious system development, maintenance, and improvement tasks.

Specification documents are written to record: performance and design requirements for the identified functions and functional relationships; the detailed design solutions implemented; and the restrictions and limitations within which the system is intended to operate.

Testing documents record the test plan, test procedure, and generated test results. Tests are conducted at the item level, the subsystem or modular assembly level, and the system level. Tests are intended to verify that the item or assembly or system performs to the level prescribed by the related specification. Such tests are prescriptive by nature and are performed in a controlled environment. Their goal is to determine that acceptance levels are met, and that the required documentation for the specified hardware and computer program products agrees with the items as produced.

Systems evaluation is performed on an operational system in an uncontrolled (but measured) environment to determine the actual capability for service of the system. Such activities require the development of special recording, simulation, and processing tools; the development of thorough and highly coordinated test plans and procedures; the detailed analysis and study of system operation and of collected and processed operational data. Evaluation--repeated--can show the growth of service capability as a result of operator or user experience, fault correction, or system improvement. Human actions, reactions, and interactions determine, to a large degree, system service effectiveness and cost effectiveness. Evaluation serves to pinpoint procedures that can be improved and often indicates the nature of the solution. Often system tests can be used to support evaluation.

A well designed system contains a recording function that collects data at a low recording level during operational periods to provide a record of performance and use. Increased recording, either preplanned, manually started, or automatically initiated as a result of a detected "condition", should not interfere significantly with system operation yet should provide needed insight into system operation to assist in malfunction detection and correction.

EXAMPLES

Within a reasonably complex system one can expect to find many different types of documents. Each document type in the examples shown below serves a particular function. Although different "titles" could be used, and a different "packaging" approach could produce a different number of physical documents, the total information needs of the system are nearly invariant.

Documentation must be viewed as serving specific needs, and the early detection and definition of such needs is a crucial stage of the system development process. Change control, maintenance, and updating of the

system itself must be performed in accordance with documented procedures, and the impacted documents must be updated and modified in accordance with documented guidelines. The examples below, while not exhaustive, illustrate many of the system documentation needs.

System Documents

System documents include the:

General System Specification. A single document that provides Performance/Design Requirements.

Modular Assembly Specification. One document for each identified module or subsystem that makes up the system.

System Test Plan. Provides a schedule of system tests, locations, and times.

System Test Procedures. Defines tests and gives detailed information needed to conduct system tests.

System Test Philosophy. Describes test approach.

System Description. A non-technical discussion and representation of system functions, uses, and relationships.

End Item Documents

These end item documents include:

CPEI Specification. Computer program end item specifications with one specification document for each program such as a monitor or read routine. Each specification document has two parts:

> Part I of the specification contains the design requirements, design limitations, interface relationships, and critical parameter values.
>
> Part II of the specification contains the actual design information and operational details which adequately describe the produced product and its normal and peculiar operational characteristics and limitations. (Includes listings.)

HEI Specification. One hardware end item specification is prepared for each item such as a power supply, terminal, tape unit, or computer. Each specification (as described above for a CPEI) contains two parts.

Item Test Plan. An initial test plan document is prepared for each end item concurrently with the preparation of the Part I Specification. The final test plan is recorded when the final design of the end item is approved (before the item is built).

Item Test Procedure. An initial test procedure is prepared concurrently with the selection or development of the final design of the end item and the final procedure and required support tools are prepared by the time the item is built.

Item Test Result. This document describes the results of applying the test procedures to the developed end item. This document is written after tests are performed in accordance with test procedures.

Support Documents

Documents in this category are identified (usually) with the development and operation of the actual system. These include:

Procedural Manuals. Documents that describe and prescribe how functions or operations are to be performed. In CIS, most of these procedures will parallel traditional library activities; some, however, will provide guidance for new activities not previously performed by librarians (or users). Many documents of this type are administrative, others are technical, and some are for training purposes.

Standards' Manuals. Collections of guidelines used by system developers, operators, and users. Examples might include a glossary of terminology, a listing of official terms and parameters, programming conventions and restrictions, and charging (cost) algorithms.

Operator Manuals. Documents developed for the guidance of those individuals that perform a role within the operational system (direct service, support, or maintenance). These documents present a detailed explanation of the interrelationships and features of each part of the system--and the environment in which the system operates. Each operating position is described in terms of the actions needed to support system performance.

User Manuals. These documents are written to guide those who intend to use the system, but who do not need detailed knowledge of its inner workings. A user interfaces with the system but is not a "part" of the system although his presence may be needed before certain system functions become operable. This document provides the user with just enough detailed information so that he can interface effectively and satisfy his needs. The user manual also assists the user in interpreting system-generated output as well as serving as a guide to the preparation of user-generated input.

Handbooks. A general collection of pertinent information that may be combined in one document instead of separate user and operator manuals, or may serve to supplement such manuals. Such a document can record numerical data, guidelines, formulas, tables, graphs, and data lists that would be awkward to include in previous manuals. Other versions of handbooks present descriptions and discussions of system operation that can be used to indoctrinate and train both users and operators.

Plans, Schedules and Reports

Development schedules and mechanisms to report progress are essential to guide system development activities. Plans are needed to keep aspects of the development in perspective. These documents include:

Planning Documents. Documents that record intended actions and scheduled activities. They serve to inform and guide decision makers, and as such must be kept up-to-date. The planning document often contains time, manpower, and cost estimates related to defined tasks or goals.

Development Schedule. A separate document or part of a planning document usually built around a milestone type presentation of time-phased tasks. Tasks are numbered, titled, and defined. Dependencies are included in milestone charts and critical paths are identified. Each task is identified with the person or group of organizational designation responsible for task completion during indicated time periods or by stated due dates. Some chart presentations do not indicate task dependencies.

Progress Reports. These documents record actual progress in terms of established goals or tasks. The degree of detail can vary significantly. For a specific task, such as the preparation of a computer program or a user's manual or a procedure's manual, a method of internal detailed reporting should be used that precisely indicates progress in terms of identified subtasks and expended manpower, time, and cost. Reports that provide an overview of progress should not be as specific but should be based on detailed information.

IX. SYSTEM TEST AND EVALUATION CONSIDERATIONS

During Phase IIB the primary concerns of the Institute are to insure that users' information needs and users' methods of manipulating such information are defined in terms of the CIS program, and that adequate system test and system evaluation concepts, plans and schedules are developed. These products are needed so that the proper tools and procedures can be prepared to support both the operational validation tasks required in Phases III and IV and the system capability investigations also required in Phases III and IV and during ongoing operation.

GOALS

It seems self evident that user satisfaction is the ultimate factor in evaluating a service system. While there are many subfactors involved in user satisfaction, the fact remains if the users do not like the service it must be considered a failure regardless of how perfect the system may be in terms of cost, equipment, programs and efficiency. Therefore, an important goal for this phase of the CIS project is to determine the nature of the information needs of potential users and how they would employ the data derived from CIS. One approach to this problem is through the established campus User Committees; another is through user surveys.

A second goal for this phase of the project is to develop methods, concepts, plans and schedules for testing and evaluating the system in light of the needs and services required by CIS users. Many factors and issues must be considered in developing the various test and evaluation procedures. Both of the above goals must be realized in order to carry out the operational validation work required in the later phases of the project.

SYSTEM TESTING

Operational validation, more properly called system testing, is performed under controlled conditions and for specified periods to determine that the performance of the CIS system (computer programs, hardware, humans, and procedures) meets the performance and design requirements contained in the general system specification. System tests are designed to require perfect human performance since the goal is to systematically test all combinations of software products and hardware elements in an operational setting. Test results are

established using specific data recorded during test operations. Pre-specified measures are computed and the values compared with pre-established limits of acceptable performance (for stated confidence levels). These limits or limiting values may be included in the system specification; more often, the actual values are determined during subsystem testing or during an operational shakedown period scheduled as part of the system implementation phase. System tests are preceded by other testing phases (item, module, and subsystem).

Operational Shakedown

In general, the operational shakedown period is one in which both the people who developed the system and the people responsible for ultimate hands-on operation of the system work together to test system procedures and working relationships. This period is also used to test system maintenance tools and techniques; to establish acceptable performance norms; to detect and correct system errors and gross system weaknesses; and to give the operating personnel confidence in the system and in their ability to operate the system successfully. As mentioned elsewhere, system deficiencies--previously unsuspected--are often detected during shakedown. These new insights give rise to planned improvement activities; to the development of new simulation tools, processing programs, and analysis techniques; to various research programs or studies directed toward areas of uncertain or poor knowledge; perhaps even to the awareness of new concepts of operation or service.

SYSTEM EVALUATION

System evaluation is directed toward testing an operating system in an uncontrolled (but measured) operational environment. The goals are to determine how well the system performs under a wide range of operating conditions; to determine actual capability levels inherent in the system design; and to detect problem areas, subtle as well as major. Testing is in-depth, pre-planned, and especially sensitive to imperfect human performance. The latter may be caused by improper personnel assignments, inadequate training, incorrectly designed man-machine interfaces, personnel problems, or other causes. The intention of planned evaluation tests is to gather data needed to compute performance measures similar to those used for system test, to establish the validity of on-going operational measures of performance, and in each case to gather all of the supporting data needed to conduct in-depth system analysis.

The previous reference to an "uncontrolled operational environment" is interpreted to mean no artificial operational constraints are introduced into the system (or portion of the system) being tested and that the testing activity, including special data recording and measurement, does not destroy operational validity. It is true, however, that a wide range of possible operational loads and environmental perturbations are deliberately introduced so as to exercise the operational functions under

test. In some instances, simulation techniques are used to create the desired load situation. The same simulation devices also serve as research tools to support system design as well as system evaluation efforts. Often the end product of evaluation is a redesign of some system function or method of implementation.

In a system such as CIS, the user becomes a prime agent in the testing and evaluation process. Many information handling processes can be examined as to cost of implementation, cost of operation, or cost of services rendered; however, the value or benefit of a particular parameter (such as response time) is exceedingly hard to determine. Benefit-value, or benefit-cost as it has been called, is affected by so many variables that it usually eludes definition as well as measurement. Such insight is often gained too late for initial decision-making purposes; however, the anticipated qualitative value of an activity that advances the state of the art must always be kept in mind to help balance the more quantitative, often short range, values derived from cost-benefit analysis.

LIBRARY EFFECTIVENESS AND CRITERIA

A recent report* published by the Institute contains the results of a literature search to locate measures of library effectiveness. The investigators established six basic concept criteria of library performance as shown on Figure 11. In this context a criterion concept is the abstract variable which needs to be measured or evaluated, e.g., cost, use, response time, etc. A criterion measure is the operational definition or method by which the criterion will be quantified. Using previous Institute work in this area as a basis the project can determine which concepts and measures are appropriate for use in terms of the CIS program. The six concepts are: accessibility, cost, use, user satisfaction, response time, and cost-benefit. Ability of the system to provide service, and adequacy of the available data resources, determine the degree to which the system is used and of user satisfaction. Taken together, these issues establish the total economic profile which, in the final analysis, is an issue of constant, often grave concern to both user and library.

Knowledge of the characteristics of the users--and of the searchers--can help define system requirements, both initially and for future improvements. Methods of service, with variations, range from batch processing to on-line controlled computer searches in real time. System reaction depends on whether the system controls the search formulation, whether the searcher can force the system to accept (and interpret) his

*Evans, G. Edward and Harold Borko. Effectiveness Criteria for Medical Libraries. Institute of Library Research, University of California, Los Angeles, April 1970.

FIGURE 11

CONCEPTS AND MEASURES OF LIBRARY EFFECTIVENESS

1. ACCESSIBILITY

   Number of services and applicability to classes of users.
   Ratio of services requested to services available.
   Ratio of holdings to total user population (actual, potential).

2. COSTS

   Staff size.
   Staff skill and characteristics.
   Unit cost.
   Ratio of book budget to users.

3. USE

   Gross use of services.
   Ratio of actual users to potential users.
   Total library use.
   Ratio of service use to total number of users.
   Ratio of total use to total number of services.
   Percentage of materials used (by type and by class of user).
   Ratio of documents circulated to various classes of users.
   Ratio of documents circulated to active users.
   Ratio of total use to total holdings.
   Item-use-day.

4. USER SATISFACTION

   User satisfaction.
   User activities (purpose) in library.
   Percentage of items in collection as listed in a checklist.
   Percentage of items in collection by type of material.
   Percentage of various item types to classes of users.
   Quality-value of collection items based on expert opinion.
   Ratio of documents used to materials requested.

5. RESPONSE TIME

Speed of service.
Ratio of number of services offered to average response time.
Ratio of response time to total time document is of value.
Ratio of holdings to response time.

6. COST-BENEFIT

Ratio of services to cost.
Ratio of total service expenditures to users (actual, potential).
Cost-benefit.
Cost-response time.

full statement of need; or whether the search formulation is a shared responsibility with limitations on both sides. Library effectiveness studies and operational effectiveness approaches as applied to computer-based information handling systems serve as resource material to develop specific system test and system evaluation measures. In addition, operational effectiveness determination as an ongoing activity (to provide a day by day profile of system performance) also must be included in CIS design requirements.

OPERATIONAL EVALUATION AND FEEDBACK

The purpose of the CIS project is to provide information services. To this end, user satisfaction is a primary indication of the success of the project. Any amount of system efficiency and sophistication will be insignificant if the users are not receiving needed services.

User Satisfaction

A fairly comprehensive, but hopefully not overly expensive, method of evaluating user satisfaction must be designed in order to determine needed system improvements during both preliminary, experimental use of the system and during later production runs. With bibliographic services initially emphasized more than the textual and numerical services, more attention is given here to user feedback concerning the bibliographic services. It is expected that users interested primarily in textual and numerical services will form a smaller, more sophisticated user community that will be able to involve itself to some extent in the development of service specifications.

The major questions central to user service evaluation are:

1. What measurements do we wish to have?
2. What are the best techniques we can use to get these measurements?
3. What system characteristics do we wish to evaluate with our measuring techniques?

Traditionally, two parameters have been used as measurements of user satisfaction with SDI and retrospective searching: recall (the ratio of hits received to the total number of hits in the file) and precision (the ratio of good hits to the total number of hits). Common sense seems to verify the importance of these parameters. However, other factors such as user characteristics, response time, cost, and output format acceptability must also be taken into consideration.

Among the techniques used to receive feedback from users of bibliographic services are personal interviews, questionnaires and

response cards, parallel or sample runs, studies of hits and pertinency, the personal experience of the information specialist who interfaces the user with the system, and the analysis of operational use parameters recorded for this purpose. The amount of usage of the CIS system (and how much users are willing to pay) should also reflect to some extent the degree of user satisfaction. The advantages, disadvantages, and cost of such techniques for data gathering must be weighed and a set of procedures (perhaps combining the techniques) must be developed and used.

Closely related to both the measurement of user satisfaction and the techniques of measuring are the particular system characteristics to be evaluated. These characteristics should (at the time of evaluation) be changeable. Examples of these characteristics are file inversion, depth of subject indexing, profile complexity, searching on terms in the title vs. searching on terms in the abstract vs. searching on assigned descriptors, and the amount of user interaction at request time.

Operational Performance Considerations

In order to give users the best service possible, it is important to maintain a well-tuned, efficient system and to be able to adjust the system from time to time so as to obtain the maximum computing power. This means that measurements must be collected by the software in order to pinpoint areas that are costly, time or space-consuming, or, in general, are operating inefficiently. Four types of measurements that will be collected include software operating statistics, comparisons with other systems, turn around time, and system failures.

Software Operating Statistics. Built into the CIS System will be a Statistical Log on which any component of the system may write operating statistics. Such statistics could include CPU time, real time, I/O requests, number of profiles passed, number of records searched, and similar measures used to pinpoint bottlenecks in the system, to determine which routines could better be written in the assembler language for better optimization, and to discover other ways to rewrite parts of the system to produce an efficient production system. Such a log also will assist in determining the proper charging algorithms. System capabilities should permit the detailed measurements to be suppressed when only operational recording is required.

Comparison with Other Systems. Simultaneously with the development of the CIS system, experimental data bases services will be provided using a modified IBM TEXT-PAC system and the modular retrieval program described in Part I. Results can lead to both understanding and improvement of the CIS programs. These comparisons will be, initially, at a gross level of measurement.

Turn Around Time. Not only is it important that the throughput of the software system be monitored, but it is equally important that the rest of the system be monitored as well. In this area the concern will

be with measurements such as: how long it takes to get a new profile prepared, how long does it take to get a new tape ready for use by the programs, how long does it take to get the output returned to users, etc.? (Note: if the system is interactive, many of these measurements can be taken by the software; otherwise people have to record them.)

System Failures. Performance data should indicate how often the system fails due to such things as software bugs, hardware and operating system failure, clerical errors made during preparation of profiles and data bases, etc. Another kind of "failure" that will be interesting to monitor is the following: how often do we have to say "no" to a user's request because of lack of capability in our system, or a bug that has not been corrected? This kind of measurement will provide us with information concerning much-needed new or improved services.

Accounting

Customer charging algorithms will be needed. These will be based on parameters which are somewhat controllable by the user and should, within reason, be both predictable and repeatable. At the same time, they must provide the necessary cost recovery for the service organization. Since one goal of the CIS project is to reduce processing costs through resource sharing according to the available set of requesters, actual computer charges alone will not serve as they cannot be predicted or repeated. In order to recover costs through prices based on user-controllable parameters, it probably will be necessary to use statistical techniques and to weight the selected charging components according to anticipated system usage and resource sharing. Other options will be considered.

Gathered statistics will provide the information necessary to project estimates used in pricing, and the program will later provide the transaction reports used to generate the bills themselves. In general, an executing service will log out charge-related statistics for each requestor for which individually-accountable work was done, plus similar statistics for any collectively-accountable work, along with a list of the requester set. These statistics might include:

1. The number of entries passed for each file used,
2. Elapsed real time,
3. Processor time and billable I/O activity, as defined by the host operating system,
4. Main storage used.

From such statistics, a charging scheme can be derived by steps such as:

1. Listing user-controllable resources which are subjectively acceptable billing parameters.

2. Obtaining relations between total cost of operation over a sample period and the total amount of each reported resource used.

3. Building a formula, linear in the significant parameters, which tends to correlate highly with actual costs of operation.

4. Weighting the values of the formula to produce the required dollar value based on the observed total cost of operation, plus appropriate percentages of personnel costs, etc.

All library functions that are impacted by CIS will be carefully monitored so that adequate records of personnel utilization, incurred costs, and time expenditures are available for analysis. The degree to which these costs are to be reflected in customer charges will be an area of study and consideration throughout the CIS project. Recording of resources usage and recording of problem symptoms will take place in the library as well as in the computing center, and may come from allied information specialists as well.

APPENDIX A

PRELIMINARY PHASE IIB DEVELOPMENT PLANNING INPUTS

PROPOSED DEVELOPMENT SCHEDULE

The ten major task areas initially planned for Phase IIB (assuming a 12 month period) are shown on Figure A-1. The responsible development group (CCN, Library, or ILR) is indicated for each area, with two groups sharing responsibility for Area 4 (Experimental Services) and Area 7 (User Community Interface). The associated time schedule* indicates a reasonable task phasing. The material in this appendix was developed as resource material used to prepare the Phase IIB proposal.

Task Areas

The task areas shown on Figure A-1 are described below:

1. Experimental Operations. The conduct of experimental operations with interim software will provide valuable information concerning real-time operational problems and procedures, evaluation and monitoring techniques, user interface problems, and the quantity and quality of services needed. This information can serve as input to the design of the CIS software and to the design of the system as a whole. Most of the experimental operations will center around the use of the TEXT-PAC system. Plans call for providing SDI searches of the CA Condensates File which is produced by the Chemical Abstracts Service (CAS). A modest amount of effort will be needed to modify the TEXT-PAC programs to accept CAS's new Standard Distribution Format (SDF); however, initial operations will begin using the old format. Depending upon the acquisitions schedule being prepared by the Library, other data bases may be processed by TEXT-PAC during the year. Other assets include computer programs such as the ones developed to provide searching, indexing, and processing of the ERIC File (see Part 1 of this Final Report) and others that provide on-line text formatting and manipulation capabilities.

*The current Phase IIB effort is based on an 18 month development period funded at a lower level than used to develop the schedule in this appendix.

FIGURE A-1

PHASE IIB - CIS DEVELOPMENT SCHEDULE

	MAJOR TASK AREAS	RESPONSIBILITY			SCHEDULE (1971)											
		CCN	LIB	ILR	J	F	M	A	M	J	J	A	S	O	N	D
1.	EXPERIMENTAL OPERATIONS	MAJOR	-	-												
	CA - Condensates				X	X	X	X								
	CA - Condensates (SDF)						X	X	X	X	X	X	X	X	X	X
	Other Data Bases										X	X	X	X	X	X
2.	PROTOTYPE DEVELOPMENT	MAJOR	-	-							X	X	X	X	X	X
3.	SYSTEM DESIGN AND DOCUMENTATION	MAJOR	MINOR	MINOR	X	X	X	X	X	X	X	X	X	X	X	X
4.	EXPERIMENTAL SERVICES	MAJOR	MAJOR	-	X	X	X	X	X	X	X	X	X	X	X	X
5.	EXPERIMENTAL ACQUISITION	-	MAJOR	-				X	X	X	X	X	X	X	X	X
6.	PROCEDURES DEVELOPMENT	-	MAJOR	-												
	Selection and Acquisition				X	X	X			X	X				X	
	Cataloging and Announcement							X	X	X			X	X		
	Information Specialist Guide					X	X	X			X	X	X	X	X	X
7.	USER COMMUNITY INTERFACE	MINOR	MAJOR	MAJOR												
	Need Identification				X	X	X					X	X	X		
	Selection of Data Bases					X	X	X	X	X				X	X	
	Survey of Data Bases						X	X	X				X	X	X	
	Feedback from Users					X		X	X	X	X	X	X	X	X	X
8.	CIS SEMINARS	-	MAJOR	MINOR					X	X				X	X	
9.	DATA BASE EXPERIMENTATION	-	-	MAJOR	X	X	X	X	X	X	X	X	X	X	X	X
10.	TEST AND EVALUATION STUDIES	-	-	MAJOR												
	System Test								X	X	X					
	System Evaluation											X	X	X	X	X

2. Prototype Development. When the software design has progressed sufficiently, construction of a prototype of the system will begin. The prototype will serve primarily to test certain design decisions and will not necessarily represent the entire system. The initial or interim version of the prototype will probably contain some of the bibliographic services. The degree of progress is dependent on the feedback obtained from experimental operations, user interface studies, and library inputs.

3. System Design and Documentation. A set of specifications for the CIS software system will be produced along with a description of the logical components of the system. At regular intervals during the design stage, these documents will be updated to reflect the current view of the system. A final set of documents will be produced for use in Phase III. Considerable attention will be given to the preparation of a development plan and schedule for Phase III to insure continuity of design development and continuation of the services already being offered to users. Development status will be reflected in Quarterly Progress Reports.

4. Experimental Services. Both CCN and the Library will work together to provide a set of experimental services, with particular emphasis on identifying user groups and user needs, and on acquiring user feedback and guidance. Library personnel will be involved.

5. Experimental Acquisition. One of the major functions performed by the Library during Phase IIB will be to acquire needed available data bases which can be used to support experimental services.

6. Procedures Development. Successful CIS operation requires a set of library procedures for data base selection, acquisition, cataloging, and announcement. These procedures, including guidance documents for information specialists, will be prepared by library personnel under Institute guidance.

7. User Community Interface. Both the Library and ILR will work closely with the user community (particularly with the Users Committees and the Extra-Campus Committee) to determine user needs, identify and inventory available data bases, select for acquisition, and obtain user feedback. Resources of other University of California campuses will be surveyed through interface relationships with the University of California Library Systems Development project and the CIS Extra-Campus Committee.

8. CIS Seminars. Current plans call for one or two seminars to be presented during Phase IIB; however, the format may be modified to reflect more advanced CIS development needs.

9. Data Base Experimentation. Efforts aimed at developing improved data manipulation and search techniques, such as superimposed coding, will be pursued during this phase.

10. Test and Evaluation Studies. Serious studies will be conducted to determine an appropriate approach to testing the CIS system during implementation and to evaluating the operational system. Based on studies of user needs and modified by user feedback, measures of library effectiveness and user satisfaction will be investigated for both test and evaluation purposes.

Documentation Topics

The time schedule shown on Figure A-1 will be updated at the beginning of the first and third quarters of 1971 as shown by Topic K (Update Phase IIB Development Schedule) on Figure A-2. The entries on this latter figure show the task oriented documentation topics identified for Phase IIB. Most of these outputs are required for Phase III development activities. Documentation contributions and responsibilities are tentatively indicated for each development group, with the responsible group underlined. In most cases, the documents are prepared for use or release by the Institute of Library Research. In several instances, the review and approval of each group is needed before the document can be released. Basic development and resource allocation decisions require approval of the Principal Investigator.

The documentation topic outline is presented as a task development guide. While it does not necessarily identify individual documents, it does indicate that written material will be generated as required in the identified development areas to provide needed inputs for Phase III. Some of the material may appear twice during the year, with the second issue being used to revise or augment the first issue. Many of the documented topics will be updated, rewritten, or completed in Phase III to reflect development and operational progress. During Phase IIB, most of the technical documents will be developed and used as working drafts with no attempt being made to publish the document in final form until the content is complete and accurate.

FIGURE A-2

PHASE IIB - DOCUMENTATION TOPICS

(Based on 12 Month Period)

MAJOR TASK AREA	TASK TOPIC ID.	TITLES OF TASK ORIENTED SPECIFICATIONS, REPORTS, AND RELATED DOCUMENTATION OUTPUTS	SIGN OFF REQ'D (?)	DOCUMENTATION RESPONSIBILITY*& CONTRIBUTION			TIMES ISSUED DURING 1971	TO BE REVISED DURING PH. III (?)	DOCUMENT PREPARATION QUARTER (1971)				NEEDED FOR USE DURING PH. III (?)
				CCN	LIB	ILR			1	2	3	4	
1	A	Operator Manual (Draft)	No	MAJOR	Minor	Minor	2	YES	X	-	X	-	YES
1	B	Operating Experience Report	No	MAJOR	-	-	4	No	X	X	X	X	No
2	C	Standards Manual	YES	MAJOR	Minor	Minor	2	(?)	X	-	-	X	YES
2	D	Detailed Program Test Plans and Procedures	No	MAJOR	Minor	Minor	1	YES	X	X	X	X	YES
3	E	CIS General System Specification	YES	MAJOR	MAJOR	Minor	2	YES	X	X	-	X	YES
3	F	CIS System Description:											
		1. Experimental Data Base Services	YES	MAJOR	MAJOR	Minor	(?)	(?)	X	-	-	-	YES
		2. Prototype System (Interim)	YES	MAJOR	Minor	Minor	1	YES	-	X	-	-	YES
		3. Augmented Prototype System (Draft)	YES	MAJOR	Minor	Minor	1	YES	-	-	-	X	YES
3	G	End Item Specifications	No	MAJOR	-	Minor	2 ea.	YES	-	X	-	X	YES
3	H	Program Module Design Description	YES	MAJOR	-	Minor	2	YES	-	X	-	X	YES
3	I	Quarterly Progress Report	YES	MAJOR	MAJOR	MAJOR	4	No	X	X	X	X	No
3	J	Update Phase IIB Development Plan	YES	MAJOR	MAJOR	Minor	2	No	X	-	X	-	No
3	K	Update Phase IIB Development Schedule	YES	MAJOR	MAJOR	Minor	2	No	X	-	X	-	No
3	L	Development Plan - Phase III	YES	MAJOR	MAJOR	MAJOR	1	YES	-	-	X	-	YES
3	M	Development Schedule - Phase III	YES	MAJOR	MAJOR	Minor	1	YES	-	-	X	-	YES
3	N	Phase III Development Proposal	YES	MAJOR	MAJOR	MAJOR	1	No	-	-	X	X	YES
4	O	User Manual (Draft)	YES	MAJOR	MAJOR	Minor	2	YES	-	X	-	X	YES
4	P	Service Experience Report	No	Minor	MAJOR	-	2	No	-	X	-	X	No
5	Q	Data Base Descriptions	No	Minor	MAJOR	Minor	1 ea.	No	X	X	X	X	YES
5	R	Data Base Acquisition Plan and Schedule	YES	Minor	MAJOR	Minor	2	YES	-	X	-	X	YES
5	S	Acquisition Experience Report	No	Minor	MAJOR	-	2	No	-	X	-	X	No
6	T	Library Procedures for CIS:											
		1. Selection and Acquisition	YES	Minor	MAJOR	Minor	2	YES	X	-	-	X	YES
		2. Cataloging and Announcement	YES	Minor	MAJOR	Minor	2	YES	-	X	-	X	YES
		3. Information Specialist Guide	YES	MAJOR	MAJOR	Minor	2	YES	X	-	X	-	YES
7	U	Users Needs Report	YES	Minor	MAJOR	Minor	2	YES	-	X	-	X	No
7	V	Inventory of Data Bases	No	Minor	MAJOR	MAJOR	2	YES	-	X	-	X	YES
8	W	CIS Seminar Documentation	No	-	MAJOR	Minor	2	No	-	X	X	X	No
9	X	Data Base Experimentation Report	No	Minor	Minor	MAJOR	2	No	-	X	-	X	(?)
10	Y	System Test Philosophy and Plan (Draft)	YES	MAJOR	MAJOR	MAJOR	1	YES	-	X	-	X	YES
10	Z	System Evaluation Concepts	No	Minor	MAJOR	MAJOR	1	No	-	-	X	X	YES

*Underlined party responsible for content of document.